NOVEMBER

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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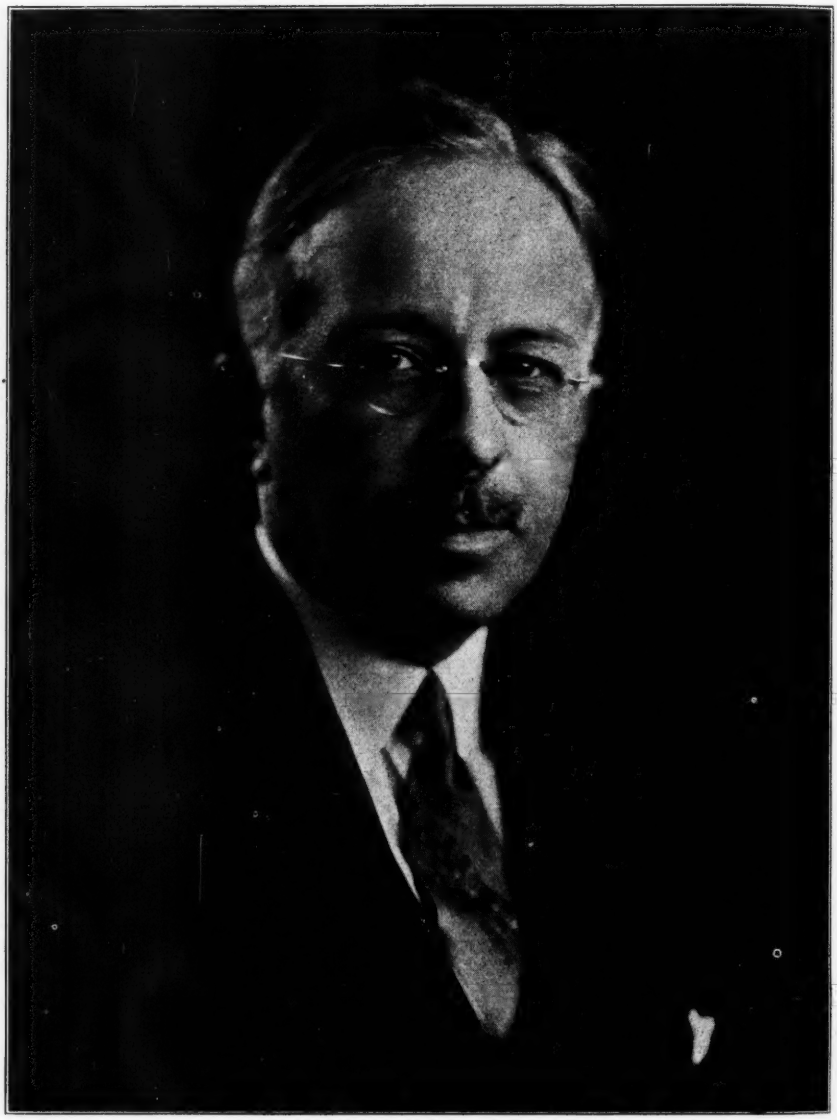

ARTHUR D. BLACK, A.M., M.D., D.D.S., Sc.D., F.A.C.S., F.A.C.D., Chicago, Ill.
President of the Chicago Centennial Dental Congress

THE JOURNAL
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Original Communications

THE RISE AND PROGRESS OF DENTISTRY *

By ARTHUR D. BLACK, A.M., M.D., D.D.S., Sc.D., F.A.C.S., F.A.C.D., Chicago, Ill.

IT is particularly appropriate that the dental profession should celebrate Chicago's centennial year by meeting in this city, since the organization and major development of our profession have occurred within the past one hundred years. The first dental society was organized in 1834. It is a matter of interest that Chicago's first dentist, William H. Kennicott, began practice in the Eagle Tavern, March 25, 1834; also, that his great granddaughter is now the wife of a Chicago dentist. Incidentally, it so happens that this Congress has toed the mark more exactly than any other in commemorating Chicago's centennial, as the village of Chicago was incorporated, Aug. 5, 1833, and our registration books for this meeting were opened, Aug. 5, 1933.

We are gathered here as a profession in the spirit which pervades Chicago, to record a century of progress, to call to the attention of the world the achievements of our predecessors and to look forward with confidence to the century ahead.

We pay especial homage to our forefathers who, imbued with true professional spirit, labored zealously and sacrificed much in order that the ideals of Hippocrates might be firmly set as one of the corner stones of our development. A few worthy representatives of this group have been recognized by the placing of their busts upon this platform and the deeds of others have been recorded on bronze tablets affixed to the walls of dentistry's exhibit at A Century of Progress Exposition.

Dentistry was doubtless practiced in some crude way in the Garden of Eden, for dental disease dates back to the earli-

*President's address, read at the First General Session of the Chicago Centennial Dental Congress, Aug. 7, 1933.

*The historical data in this paper were taken very largely from notes compiled by George B. Denton for a forthcoming book on the history of dentistry.

est knowledge of man. In the oldest prehistoric skulls, such as the Piltdown, Neanderthal and Rhodesian, there is evidence of dental caries, alveolar abscess, pyorrhea and malocclusion.

We know that, as early as the fifth century before Christ, the Egyptians had "doctors for the teeth," and there are records of a rather definite program among both the Egyptians and the Chinese for several centuries before the Christian era.

In those early days and for many centuries afterward, caries was thought to be due to worms in the teeth or the perversion of bodily humors. Practice seems to have consisted very largely of extractions, the stabilization of loose teeth and the occasional replacement of one or two teeth that had been lost, by the use of gold bands attached to neighboring natural teeth.

Following the submersion of everything worth while during the Middle Ages, the dawning of the profession may be said to have occurred in the sixteenth century, with the anonymous publication, in Germany, of the first book on the practice of dentistry, in 1530. It mentioned the use of gold leaf for filling teeth and stated that decay was caused by a "sharp moisture," meaning an acid. Curiously enough, the last chapter in this book is devoted to the care of the hair, reflecting the work of the barber-surgeon guilds, whose members devoted a part of their time to drawing and scraping teeth.

Two other important dental books were published in the sixteenth century. In 1563, Bartolomeus Eustachius, Italian, wrote the first book on dental anatomy, in which he described the enamel, dentin and pulp, also the blood and nerve supply of the teeth. This was followed, in 1582, by another work on dental anatomy in French, by Hémard.

In the seventeenth century, van Leeuwenhoek, Dutch, was the first to use the microscope in the study of the teeth. He described the tubules in the dentin, also "animalcules," probably bacteria, on scrapings of calculus. Highmore described the maxillary sinus and noted the proximity of the roots of the teeth. Ruysch, of Holland, discussed pyorrhea and said it could not be cured. Fillings were made of gold leaf and lead; camphor and opiates were used for toothache. Sulphuric acid and the cautery were used to destroy pulps. Ambrose Paré made obturators for cleft palate. The first English dental book, by Allen, appeared in 1685. Forceps, elevators and the pelican were used for extracting, and the first full dentures were introduced about the year 1700.

The eighteenth century might well be called the Century of Fauchard, the first to express a conception of broad professional development, although a hundred years were to elapse before the actual foundations could be laid. His wonderful book, elaborately illustrated for the time, and published in 1728, was the first comprehensive work on practice. He mentions the hand drill, rotated by thumb and finger, also the bow drill. He practiced pulp removal and made dentures with springs to hold them in place. He commanded the respect of his colleagues and directed their efforts and interest along lines of professional advancement. He has been appropriately called "The Father of Dentistry."

Four other French dentists followed Fauchard with famous books: Bunon, on prevention, in 1743; Mouton, on prosthesis, in 1746; Bourdet, on practice, in 1757, and Jourdain, on oral surgery, in 1778. Bourdet mentions the annealing of gold, refers to the planting of teeth and describes the surgical treatment of

pyorrhea about as well as has been done in recent years.

The most remarkable book of this group is that by Bunon, particularly in its view of prevention. He dealt with diet, mentioning especially that of the expectant mother, and emphasized the importance of the nursing period to the development of the teeth. He laid down rules for oral hygiene, discussed diseases of dentition, stressed especially the care of children's teeth and mentioned the relation of dystrophies of the teeth to periods of malnutrition and illness.

During this same period, Purman, German, made wax models for dentures, in 1705, and Pfaff, German, took wax impressions and made plaster models, in 1756; yet it was nearly one hundred years afterward that Amos Wescott, American, first used plaster to take an impression of a mouth. Upper dentures were made in about the same general form as the lower, to rest principally on the ridge. It is not known when the first dentures were made to cover the vault of the palate. J. P. Scott appears to have been the first to mention them, in 1831.

In England, John Hunter, the renowned naturalist and scientist, published his book on the "Natural History of the Teeth," 1771. He collected countless specimens of animal jaws, laying the foundation for the study of comparative dental anatomy. He made minute dissections of the teeth, which are still preserved in the museum of the Royal College of Surgeons. He also conducted pig-feeding experiments to ascertain the effect of certain diets on the enamel and dentin, and determined that enamel had no circulation, also that dentin was vascular only before it was calcified.

In the early nineteenth century, several more important books were published. The first dental book in America was written by Skinner, in 1801.

Thus we find that Fauchard's influence, particularly in the matter of publishing views on professional problems, as well as methods of practice, in connection with which he recommended the exchange of ideas for the benefit of the profession and the improvement of the general quality of service, had spread to all countries in which dentistry was practiced. The germ of professional ideals, planted by him, had sprouted, and there was an almost simultaneous development in practically all centers of advanced civilization.

Fauchard had said that we must have systematic professional training, adequate literature and proper legal restrictions. To these were added the actual organization of the profession itself. Systematic education began with lectures in Guy's Hospital, London, in 1799, by Joseph Fox. Many leading practitioners in America offered private courses of lectures; among these, L. S. Parmly, in the East, in 1820 and John Harris, a few years later, in the Middle West. Horace Hayden gave lectures on dentistry at the University of Maryland Medical School in the early twenties and John Harris gave a similar course in Transylvania University, Lexington, Ky.

In 1834, the first dental society was organized: the Society of Dental Surgeons of the City and State of New York. This body appears to have been concerned about legal registration and professional cooperation. In a measure, it endeavored to take the law in its own hands, and originated the D.D.S. degree, which it granted to its members, thus glorifying them and striking a blow at those who were, presumably, less well trained.

Chapin A. Harris, in 1839, estab-

lished the *American Journal of Dental Science*. In 1840, Harris and Hayden organized the Baltimore College of Dental Surgery, of which Hayden became president, and the American Society of Dental Surgeons, the first association designed to be of national scope, of which also Hayden was first president. Harris was active in both of these undertakings. He also published the first edition of his famous book on practice in 1839, and later compiled the first dental dictionary, published in 1849.

In the Middle West, a similar development took place a few years later, with James Taylor, of Cincinnati, as the leading spirit. In 1844, the Mississippi Valley Association of Dental Surgeons was formed, with Taylor as its first president. In 1845, the Ohio College of Dental Surgery was organized, with Taylor at its head, and, in 1847, the *Dental Register* was established by Taylor.

Alabama passed a dental law in 1841, but it was not enforced. It was not until 1868 that Kentucky, Ohio and New York passed the first effective laws.

In England, annual courses of lectures had been given by Robert Blake and others at Guy's Hospital, following those instituted by Fox in 1799. In 1841, an appeal was made to parliament and to the medical profession to appoint a dental board to issue diplomas to dentists who might pass the examination. The appeal was denied, but eventually granted in 1860. The Odontological Society of London was organized in 1855. The Metropolitan School of Dental Science was founded in 1857, and the London Dental Hospital in 1858.

Similar developments were in progress in Germany, France and other countries of Europe. The first German society was organized in Berlin in 1846, and the first journal, *Zahnarzt*, was founded the same year. The first dental school was established in 1884. In France, the Society of Dental Surgeons was organized in Paris, in 1847, the first journal, *L'Art Dentaire*, was published, in 1857. The first school was established in 1879.

CONTRIBUTION OF WELLS AND MORTON

During this very period of organization, dentistry made one of its more important contributions to human welfare. In 1844, Horace Wells, dentist, demonstrated the value of nitrous oxide gas as an anesthetic for surgical operations, and, in 1846, William T. G. Morton made the first public demonstration of the use of ether as an anesthetic. These contributions to the relief of human suffering cannot be fully appreciated today, because we have no possible conception of the horrors and terrible suffering of patients who underwent surgical operations previous to the use of anesthetics.

After its initial organization in America, the advancement of the profession was slow. The American Society of Dental Surgeons continued for seventeen years, until 1856, when it was forced to disband because it would not permit the use of amalgam by its members. The American Dental Association was organized in 1859 and has continued through several reorganizations to celebrate its diamond jubilee.

In the Central West, the Mississippi Valley Association was superseded by state societies organized in that region. Before 1860, state societies had been formed in Michigan, Indiana and Georgia. During the next ten years, thirteen more states were organized, and there was a total of twenty-nine before 1880. All other states followed in due time, and the passage of dental laws was a natural sequence of the organization of state societies.

Twenty-five years after the first dental

school was established, there were but four colleges, and the total number of graduates up to that time was 1,065. Harvard was the first university to establish a dental department, in 1867. The passage of dental laws by the several states forced the change from apprenticeship training to organized instruction, and the number of schools increased to thirty-four in 1890 and to fifty-seven in 1900. This number included many commercial schools, organized for profit. As the requirements for admission were advanced and the course of instruction was lengthened, the number of schools was gradually reduced. There are now thirty-eight in the United States, with a total enrollment of about 8,000.

Previous to 1897, almost anyone who could speak a little English was admitted to dental college, and the dental course consisted of two years of from three to five months each. Since then, the entrance requirements have been gradually advanced to one year, and by some schools to two years, of college and the dental course extended to four years of thirty-two weeks each.

These changes in the program were only possible as a result of the increasing interest of universities in dental education, which was the direct result of greater appreciation of the importance of dentistry's place in the health program. Most of the commercial schools disappeared because they could not maintain educational standards and operate at a profit. Today, all but four or five dental schools are departments of universities.

During the past century, our literature increased in periodicals and books, and the content of both reflect an interest in research, which, until about twenty-five years ago, was carried on almost entirely at the investigator's personal expense. In the last analysis, the devotion and untiring efforts of the comparatively few men who sacrificed much in the study of our fundamental problems did most to direct the scientific trend of the profession which justified its elevation to its present status.

Among the notable developments of the century were: the making of the first single porcelain teeth by Fonzi of Italy, about 1804; the use of vulcanite for obturators and soon afterward for dentures; studies of anatomic articulators, initiated by Bonwill and continued to the present time; the publication by Robertson, of England, in 1839, of a small book on caries which did much to change the trend of thought from the old theory of internal inflammation to that of external chemical dissolution, followed by the discussions of Regnard, Magitot and Sir John Tomes.

The first thoroughgoing study of micro-organisms as a factor in caries was published by Leber and Rottenstein, in 1867, followed by the work of Milles and Underwood, of England, and soon afterwards by Miller's studies of caries of the dentin, which stand out as one of the most complete and undisputable investigations of this period. J. Leon Williams and G. V. Black followed with their investigations of the beginning and progress of decay in the enamel, which paved the way for G. V. Black's "Extension for Prevention" in cavity preparation, together with his studies of the physical properties and manipulation of filling materials, particularly amalgam and gold foil.

Robert Arthur discovered the cohesive property of gold foil in 1855. Barnum first used the rubber dam in 1864. Scientific studies of amalgam were made by Sir John Tomes, Charles S. Tomes, Hitchcock and Bogue, to be followed by

the more exhaustive researches of G. V. Black in the late nineties, and the still more recent studies of the U. S. Bureau of Standards.

Many are entitled to credit for their contributions to the manipulation of gold foil. Likewise, credit might be given to many for the early development of the gold inlay. Ames was a pioneer in the study of the matrix type and Philbrook appears to have made the first cast inlay. The late William H. Taggart is clearly entitled to the credit of having developed and presented this method, in 1907, in such manner that it promptly came into general use.

Similarly, advancements in orthodontia, crown and bridge work, oral surgery and other departments of practice might be cited.

THE OUTLOOK

Our program of professional education is gradually becoming crystallized on a firm foundation of the basic sciences, including the fundamentals of medical practice, which are essential to an understanding of disease and the correlation of dental and systemic conditions. This is supplemented by an extremely high development in technical training, so that the dental graduate of today is probably better qualified to enter practice immediately and serve more effectively than is the graduate in medicine to practice any of the specialties in that field.

The program of dental education has been under almost continuous discussion in recent years, including its relation to the medical curriculum and the practicability of including all or a part of the dental course in that of medicine. In my opinion, the dental curriculum cannot be satisfactorily merged with that of medicine until the medical curriculum is so modified that medical students may be qualified to enter specialty practice on graduation. To do this, the medical school must extend its course to include training for the specialties, or readjust its basic courses to the needs of those students who might decide during their first year which, if any, specialty they intend to follow. In every case, the dental student has made the decision in advance of his matriculation.

At the present time, whether the dental student takes his basic studies in a medical school or not, the courses are selected and generally modified to meet his future needs in practice. The dental student does not take a course in obstetrics, yet every medical student is required to do so. Does the rhinologist have greater need for a course in obstetrics than the dentist?

Until the faculty of a medical school has shown sufficient appreciation of the diseases of the mouth and their health relationships to include at least one short course of lectures on oral pathology in the medical course, that faculty should not be entrusted with very much responsibility for the teaching of dental students. No objection is offered to the instruction of dental students in a medical school, but the responsibility for the character and quality of the instruction should rest with the dean of the dental school.

Graduate and postgraduate instruction, today a definite part of the program of a number of our dental schools, promises much for the improvement of specialty practice, teacher training and research. In both medicine and dentistry, proper restrictions must be put in force to insure the public that those announcing themselves as specialists have had adequate training and are qualified.

Research is essential to progress, and a great change has occurred in dental research during the past twenty-five years.

Our universities and other specially endowed institutions have supplied facilities and financial aid to dental research workers, and have thus stimulated the study of our unsolved problems. The American Dental Association has cooperated in this.

It is estimated that about $50,000,000 has been contributed for dental education, children's dental clinics and research in America during the past twenty-five years. It is not possible to separate these items and determine the amount devoted to research, although it is well known that all colleges and special clinics which receive support from endowment funds or special gifts have devoted a reasonable share to research. In the future, the rating of our schools is likely to be based upon the extent and quality of their research activities. The active investigator is up-to-the-minute, and he imparts his interest, enthusiasm and knowledge to his classes.

The main trend of dental research in the next twenty-five years is likely to be in the basic sciences: in anatomy, physiology, biochemistry, bacteriology, pathology and physics. It is important, therefore, that each dental school make a special effort to interest teachers of these subjects in our dental problems, to the end that they will become thoroughly imbued with the health values of dentistry.

Dental research should follow three main avenues: (1) studies of conditions related to normal development, which are mainly concerned with diet and general health problems; (2) methods of maintaining the efficiency of the teeth in mastication and (3) studies of mouth conditions in relation to the general health.

All studies of prevention point to the importance of getting closer to the source. Possibly, very few dentists realize the progress that the profession is making in preserving the teeth of children. Sufficient time has not elapsed and numerous statistics are not available, but a few years will disclose the fact that, in practically all cases in which a cooperative program is being carried out by patients and dentists, the natural teeth are being preserved for old age.

A few examples may be cited: There will be reported at this meeting results of the systematic treatment of nearly 300 children over a period of eighteen years, in the private offices of about forty dentists. The records of fifty children for whom service was begun before the first molars erupted and has been continued over a period of fifteen years show that but three permanent teeth have been extracted and the pulps removed from three other permanent teeth. This is a total of 750 child-years of service.

One general practitioner has reported on twenty children for whom service began at ages from 3 to 7 and continued over an average period of fifteen years, a total of 300 child-years of service. For this group, two pulps became exposed by caries and six died of thermal shock. This is an average loss of one pulp for each thirty-seven child-years. The eight pulps which became involved were all in the mouths of three children who were unusually susceptible to caries, as shown by the fact that one had thirty-two fillings, another thirty-seven and the third fifty fillings at the end of the fifteen-year period. Only two permanent teeth were extracted for this group, an impacted bicuspid and a third molar. The same dentist, who does all extractions for his patients, reports only three permanent teeth (third molars excepted) removed for patients under 40 years of age during a seven-year period.

Dental service in the immediate future faces not only the question of means and methods of preserving the teeth to old age, but also serious social and economic problems. We may divide our people into three economic groups: first, about 25 per cent, who can afford to pay for dental service; second, about 50 per cent, consisting of all families whose incomes are $2,000 or less; third, about 25 per cent, who depend on charity. The first group, who can afford to pay, may again be divided into those who give the fullest cooperation and are receiving the best possible service, and those who are more or less indifferent to dental care and its health relationships. The number who are cooperating most fully is limited. Further success depends on the results of research and appreciation by the dentist himself of the possibilities of such a program and his ability to secure the cooperation of an ever-increasing number of patients. The extension of our lay educational program will assist in this.

The greatest problem of all is the development of plans within the profession by which about half of the entire population, with family incomes of $2,000 or less a year, can receive dental care. This, which is not a charity group, deserves the most sympathetic consideration by both the medical and dental professions. Service must be provided on a plan by which the dentist will be sufficiently paid for his services out of the pockets of the families in this low income group.

The only present solution of this problem is gained by looking one or two generations ahead. Today, the mouths of a very large percentage of the older children and the adults of this group are already so nearly wrecked, owing to neglect during early childhood, that satisfactory restoration and future care would require the full attention of more dentists than are in practice today. We must, therefore, choose between an ineffective program applied to the entire group and a new deal for the next generation.

Statistics now available indicate that these children may be given excellent service for fees which will not be too great for the meager incomes of their families. Records covering the care of fifty children over a period of fifteen years, previously mentioned, show that the service for these children occupied, on the average, from two to two and one-half hours a year of the dentist's time. This means that the yearly care of each child would cost little at the average regular hourly fee. The program is based on early beginning and regular visits at frequent intervals. This group can be reached and educated through the public and parochial schools.

The care of charity cases, which constitute about 25 per cent of our population, is primarily a social problem, to which the dentist will always be found willing to contribute more than his full share. In the main, the burden rests with our city and county governments and social agencies, yet members of our profession must formulate the plans and direct the work.

In discussing the increased interest in children's service, I wish to pay my respects to the dental hygienists, who, in public schools and private offices, are so effectively interesting children in problems of dental health. May I also congratulate the dental assistants who have shown a similar interest in the care of children.

Lastly, I commend to the members of the profession all of the younger children everywhere in the world. The opportunity of the dental profession is in their mouths. The conservation of their teeth and of their health in its dental relationships is our principal responsibility.

PRESIDENT'S ADDRESS*

By G. WALTER DITTMAR, D.D.S., F.A.C.D., Chicago, Ill.

A Century of Progress is a most fitting term to apply to the development of dentistry in America. Dentistry as practiced a century ago was crude, unscientific and usually distressingly painful to the patient. Antiseptics and anesthetics as we think of them today were unknown. Interpreted in the parlance of that time, a dentist's job was essentially to "pull" teeth and "plug" cavities. The replacing of lost teeth by artificial means was carried on to a limited extent, but the results usually lacked all the primary requisites of present-day artificial dentures. Dentistry was essentially a trade, and dentists obtained their knowledge by apprenticeship, for a limited time, with another dentist. No dental association, no dental journal, no dental college and no dental law were in existence.

However, there were a few men in the then unrecognized profession who foresaw the needs of organization among dentists, and, in line with the trend of those times, when organization was the impelling force responsible for rapid advancement throughout the world, they advocated the organization of a dental association. Foremost among the leaders was Horace Hayden, who, with his colleagues, recognized the necessity for furthering dental education and improving dental service, as well as for creating and maintaining ethical standards to be applied to the relationship between dentists and their patients and between members of the profession. The rank and file of the dental profession at that time possessed anything but an enviable record, but we can be forever grateful that there were a few men of strong, sterling character practicing dentistry, men who were educated and had vision and a determination to improve the profession. They realized that a means must be provided to sort out or separate the better class of dentists from the undesirable element—those who were unqualified and incompetent, particularly the charlatan and the quack.

Thus, in 1834, just ninety-nine years ago, the first dental society of record in the world was created, in New York City. In 1839, the first issue of a dental periodical, the *Journal of Dental Science* made its initial appearance. In 1840, the first dental college in the world, the Baltimore College of Dental Surgery, founded by Horace Hayden and Chapin A. Harris, began its first course of instruction, with the object of conferring a dental degree. In 1842, the first legislation to regulate dental practice and protect the people of the state was enacted by the Commonwealth of Alabama.

Dentistry received its earliest great impetus and recognition in 1844, through a discovery made by a dentist. It was Horace Wells of Hartford, Conn., who first publicly demonstrated to the world

*Read at the Seventy-Fifth Annual Session of the American Dental Association, in conjunction with the Chicago Centennial Dental Congress, Aug. 7, 1933.

general anesthesia produced by means of nitrous oxide gas. In 1846, another dentist, William T. G. Morton, successfully demonstrated the use of sulphuric ether as a general anesthetic, in the Massachusetts General Hospital in Boston. These great discoveries by dentists, who demonstrated publicly a means of rendering major surgical operations painless, gave world wide prominence not only to Drs. Wells and Morton, but also to the dental profession which they represented. So it is that dentistry is accredited with the discovery of general anesthesia, one of the greatest boons ever given to mankind. The prominence attained by dentistry, and the influence of the "panic" of 1837, led many men to enter the profession, while this in turn caused the need of more dental colleges and dental societies. Two national dental societies had been organized, the American Society of Dental Surgeons, in 1840, and the American Dental Convention, in 1855, both of which filled a temporary need in the young profession, but which the profession soon outgrew.

With this brief description of the background of the dental profession in the late fifties, we note the conditions which existed when J. H. McQuillen, of Philadelphia, issued a call to the dental profession for the organization of a new national society of dentists. This meeting convened, Aug. 3, 1859, and organized the American Dental Association. W. W. Allport, of Chicago, was elected president and Jonathan Taft, of Cincinnati, secretary, at its first meeting.

The secession of the southern states from the Union to form the Confederate States of America in 1860-1861 drew from the membership of the American Dental Association those dentists residing in the Confederacy. They in due time organized the Southern Dental Association, which, in 1897, dissolved its organization and again united with the parent society, the two organizations assuming a new name, the National Dental Association. This name was again changed to the original one, the American Dental Association, at the annual meeting in Los Angeles, in 1922, at which a reorganization was effected and the association incorporated under the Illinois law.

This Association is now in its seventy-fifth year, and today we commence the celebration of its Diamond Anniversary. I regret that the limited time at my disposal will prevent even a brief review of the history and accomplishments of the Association during the past three quarters of a century, which would be an interesting and fitting topic on this occasion. Suffice it to say that it is the leading organization of dentists in the world, now possessing a membership of about 30,000. It has had a great influence in shaping the progress of dentistry throughout the world, for in its membership have been and are now the dental teachers, authors, editors and inventors who have brought American dentistry to the enviable position it at present occupies. To the many noble men of the past who gave the best efforts of their lives to render to humanity a service for which there was dire need and in the accomplishment of which they succeeded so well, let us express our deepest gratitude.

It is with a feeling of sadness that I note the death and great loss to our Association during the past year of two of our past presidents, M. F. Finley, of Washington, D. C., who served as president in 1905-1906, and Martin Dewey, of New York, my immediate predecessor

in office. The pages of THE JOURNAL have recorded, in addition to the obituaries of these two past presidents, notices in memoriam of a number of our beloved members. Among them were dentists who, through their remarkable achievements in science, invention and research, were accorded world recognition; others who were renowned teachers in our colleges; others again who worked tirelessly for the progress of organized dentistry, and many others who found in their dental practice ample opportunity for lives of loyalty, earnestness and devotion. In respect to their memory and to all who preceded them, I ask you please to rise. Let us stand for a moment with bowed heads in silent reverence to the memory of our departed members.

The democratic form of organization of the American Dental Association, its excellent journal and its numerous departments are conducted for the benefit of the public as well as of the Association's membership. The following list of these departments may be of interest to you because it suggests the diversity of service and range of activity in our organization. These are the Bureau of Public Relations, the Library Bureau, the Bureau of Chemistry, the Council on Dental Therapeutics, the Judicial Council, the Dental Educational Council, the Committee on Dental Indexing, the Committee on Dental Legislation and Correlation, the Relief Commission, the Dental Relief Fund Committee, the Research Commission, the Committee on Group Life Insurance, the Committee on Dental Health Education and a number more connected with the Association's business and official activities.

In addition to these departments, six new activities have been added during my administration. These are the Committee on Dental Health Survey, the new Committee on Dental Educational Publicity, the Committee on Organization and Membership, the American Dental Foundation, Incorporated, the Committee on Dental Economics and the National Board of Dental Examiners (the latter was organized several years ago, but did not function until this year). These additional activities have definitely increased the breadth of function and the efficiency of the American Dental Association.

DENTAL HEALTH SURVEY

The Committee on Dental Health Survey was organized, as the name implies, to ascertain the dental health needs of the public. To assure the success of the project, I appointed twenty-nine outstanding members of our Association, who will represent the professional, educational, legislative and civic phases of dentistry. It was my privilege to solicit the cooperation of Surgeon General Hugh S. Cumming of the United States Public Health Service, who at once manifested deep interest in the matter and generously agreed to authorize experienced dental officers of the United States Public Health Service to make the survey. Dr. C. T. Messner, of Washington, is chairman of the committee. At a meeting held in Washington, April 28, 1933, by the executive council of this committee, it was decided that, in order to make progress as rapidly as possible, the initial activities of the committee should be restricted to a survey of existing dental health service activities in state, municipal and county public health organizations and educational institutions and organizations. As the work of this survey would penetrate deeply into all state, county and city health organizations and could function only with the wholehearted consent and cooperation of local health and educational

officials, it was necessary next to solicit the cooperation of the officers of the Association of State and Provincial Health Authorities of North America.

A conference was called by Surgeon General Cumming, with the result that the Committee of State and Provincial Health Authorities approved the dental health survey as proposed by the Public Health Service, and pledged its cooperation to the fullest extent in carrying out the study. I am pleased to report that work on this survey has been in progress since May 1.

So completely does the Editor of THE JOURNAL, Dr. C. N. Johnson, in an editorial on this subject in the April, 1933, issue of THE JOURNAL express my sentiments that I can do no better than to quote the last paragraph, which says: "It will become apparent at once that dentistry is placed under the deepest obligation to Surgeon General Cumming for his spontaneous and wholehearted offer to cooperate with our Association in this important and praiseworthy activity. It is a gesture that will not only redound to the benefit of our citizens, but will also call forth the universal gratitude of the members of our profession." I am pleased to express the same sentiments to Dr. Stanley H. Osborn, president of the Association of State and Provincial Health Authorities of North America, for his generous cooperation.

DENTAL EDUCATIONAL PUBLICITY

In cooperation with the Committee on Dental Educational Publicity, of which Dr. C. Willard Camalier is chairman, I presented to Surgeon General Cumming, at Washington, last December, a plan for publicity in dental health education, which I shall endeavor to state briefly. It was proposed that, under the direction of the Bureau of Public Relations of the American Dental Association, dental health messages be prepared for the lay press, for radio talks and lectures. These would be submitted to the United States Public Health Service at Washington for approval, and, when passed, would receive its endorsement. With this endorsement and that of the American Dental Association, messages going to the public would have the greatest possible force, and we believe that almost every newspaper in the country would cooperate in spreading dental health publicity. These articles would be purely educational in character, carefully prepared for the layman and entirely reliable. The Surgeon General readily agreed to the plan.

On this matter, the March issue of THE JOURNAL presented an editorial entitled, "A Tie Up with the United States Public Health Service in the Matter of Dental Educational Publicity," and commented favorably on this new department. Again we are indebted to Surgeon General Cumming for his cooperation in these efforts of the American Dental Association.

Dr. Camalier, who has been working diligently to secure the advantages of a national radio hookup to convey messages to the listening public on health conservation and its relation to dentistry, reported, June 12, 1933, that "arrangements are progressing in a most satisfactory manner for broadcasting dental educational messages over a gigantic hookup."

Another avenue through which incalcuable results in the prevention of dental diseases and their serious secondary infections are promised is early information on mouth hygiene imparted to the school children throughout the nation. In my address as president of the Illinois State Dental Society, in

1920, discussing oral hygiene, was the following statement: "The placing of a 'lesson' in each school reader would aid in keeping the subject (dental hygiene) before the child." I am pleased that I was privileged again to lend support to an activity based on the suggestion made in the foregoing quotation, an activity which is now making acceptable progress in the Bureau of Public Relations. Credit is due Drs. George H. Wandel and Lloyd Blackman for their excellent work in interesting publishers of school textbooks in this matter. In my opinion, no better avenue can be found for effectively impressing children with the importance and need of hygiene of the mouth, correct diet and proper habits, which will do much to prevent dental ills and their possible dangerous results, than well prepared, attractively illustrated lessons in the school readers and the textbooks on physiology.

ORGANIZATION AND MEMBERSHIP

The Committee on Organization and Membership under the able leadership of Dr. Albert R. Ross of Indiana has developed what I believe to be the most comprehensive and carefully thought out plan for increasing membership in our Association that has ever been presented. This is known as the "Indiana Plan," and has had wide publication in our state dental journals and bulletins during the year. In spite of the serious economic depression, which would naturally affect our roster of membership, I am happy to report that there has been no serious loss during the past year, and owing to the stimulus of this new Committee on Organization and Membership, the list of members a year hence will, I am certain, be greatly lengthened.

AMERICAN DENTAL FOUNDATION, INCORPORATED

The American Dental Foundation, Incorporated, which was announced at the meeting of our Association last year, was organized for the purpose of securing funds from philanthropic individuals and organizations to further dental science. The suggested beneficiaries of the Foundation include dental research, child welfare, dental education, dental libraries, dental publication and the Central Office of the American Dental Association. The leader in this worthy development was Dr. Edward H. Bruening of Omaha, and the first Board of Directors is made up of Drs. C. N. Johnson, Harvey J. Burkhart, C. E. Rudolph and George B. Winter, a group of men whose names at once stimulate confidence. It is sincerely hoped that every member of our Association will support the efforts of the Board of Directors in securing contributions to this worthy foundation.

Dentistry has been the recipient of a few much appreciated and outstanding gifts contributed by the Forsyth brothers, of Boston, Mr. Eastman, of Rochester, Mr. Rosenwald, of Chicago, the Carnegie Foundation, the Guggenheim Foundation, Mrs. Helen S. Carter, of Honolulu, Col. Joseph Samuels, of Providence, R. I., and others. However, a survey of the financial contributions made to dentistry in the past is disheartening when compared to those made to many other lines of endeavor, as is evidenced by the following statement by Dr. Leroy M. S. Miner, dean of Harvard University Dental School, as reported in the *New York Times*: "During 1930, according to a report from the Twentieth Century Fund, Inc., ninety-one foundations making gifts totaling more than fifty-two million dollars gave sixteen million to medicine and public health; and the same ninety-one foundations gave but eighty-one thousand

to dentistry; one-half of one per cent! And even of that amount, not one dollar was granted for dental research." It is highly probable that the dental profession has been much to blame for the meager allotment of funds, because it lacked the agency through which to make a bid for them. This agency is now provided in a well-organized, reliable foundation, whose purpose it is to receive endowments and disburse them in harmony with the wishes of the donor. It is to be hoped that dentistry will in the future receive its just share of the donations made, for they can be used with credit in its large and important field. I should like to urge the hearty cooperation of our members in the efforts of the American Dental Foundation, Incorporated.

DENTAL ECONOMICS

The Committee on Dental Economics, headed by Dr. W. O. Talbot, is busily engaged in gathering facts pertaining to the economic welfare of our organization as well as to that of its members. Its report at this meeting will without question open a new line of practical thought to every member of the American Dental Association interested in making a comfortable living.

NATIONAL BOARD OF DENTAL EXAMINERS

The most recent development in aiding dentists toward the acquisition of licenses to practice that will be recognized throughout the United States is the examination given for the first time last April by the National Board of Dental Examiners. This effort deserves our special commendation, for, while this National Board can have no legal standing, because each state is sovereign in the control of its licenses, it can and surely will have an excellent advisory effect on state examining boards, most of which will eventually, it is hoped, recognize the national examinations. The National Board of Medical Examiners is now recognized by the medical examining boards of forty-two states. As soon as the dental examining boards, as well as those of the Army, the Navy, the Veteran's Bureau and the United States Public Health Service, are convinced of the high caliber and honesty of the examinations given under the supervision of the National Board of Dental Examiners, they too, I am certain, will recognize the certificate issued by the National Board, thereby establishing reciprocity in dental licenses throughout the United States. This is a much to be desired accomplishment, and merits the wholehearted support of the dental profession.

From this brief and hurried résumé of the newer activities of the American Dental Association, coupled with the thirteen mentioned previously, it will be noted that much effort is expended in scientific advancement and professional and public welfare. The greatest influence toward the uplift and progress of the profession has come through the advancement of dental education and research.

EDUCATION AND RESEARCH

Dental education has become a matter of the greatest concern when one realizes its importance to the public as well as to the dental profession. The character, scope and objectives of the instruction by which future dentists are prepared to render oral health service affect every one.

The Office of Education of the United States Department of the Interior, in its 1932 statement on dentistry, reported thirty-eight dental colleges in the United States, thirty-one of which are rated as

"Class A," six as "Class B" and one as unclassified. Five of these require one predental college year as an entrance requirement and three years of dental college work for graduation; twenty-one require one predental year and four years of dental college work, and eleven require two years of predental and four years of dental college work to secure the degree of doctor of dental surgery. Dental educators are anxiously awaiting the report of a committee of the American Association of Dental Schools on a study of the dental curriculum which was begun in 1930. This report, which we understand is nearing completion, may be expected to offer data and recommendations that will prove a further impetus to the current improvement in all respects of the work in the schools of dentistry.

The endeavors of a few persons to induce dental and medical faculties to advocate conversion of dentistry into a specialty of medical practice have been ineffective. Efforts to disrupt dentistry by transferring some of its biologic phases to medical education and to physicians and by diverting it mechanical aspects to the technical schools and to uneducated mechanics have also been futile. The discussion resulting from these efforts has, in fact, had the indirect advantage of focusing attention on the growing importance of dentistry as a natural division of health service.

The dental profession is not only charged with repairing the results of dental disease and restoring teeth to comfort and usefulness: its first duty lies in doing everything possible to prevent dental and oral infections, thereby averting many diseases that result from secondary infections caused by the presence of diseased teeth. Commendable work has been and is being carried on in dental research, but many problems are yet unsolved. The problems associated with certain phases of dental caries, dental pyhorrhea and dental erosion, as well as questions of diet, the cause of cancerous lesions and other serious conditions, are not solved. Investigation of these questions by properly trained research workers is of great necessity. The American Dental Association has contributed to dental research in the past, and is at present carrying on some important investigations. Many of our members are also active in the International Association of Dental Research, the purpose of which is the solution of these baffling problems.

Recent nation-wide legislation regulating dental practice has acted as a potent force in the recognition of the profession of dentistry. I speak for the American Dental Association as well as for the profession in Illinois when I express to Governor Horner, of Illinois, our deep appreciation and gratitude for his endorsement of the recent dental bill in this state and his influence in bringing about its enactment as a law. This law replaces a worn-out, vague, even contradictory one, having poor provisions for its enforcement and a light penalty. Now, corporation practice of dentistry is forbidden, advertising is regulated in a manner to uplift the profession and a penalty has been provided that is strong enough to act as a deterrant. Similar laws have recently been put into effect in Maryland, Michigan, Ohio and Wisconsin. North Dakota, West Virginia, North Carolina and New York have succeeded in changing the dental codes in their states. This recent legislation is unquestionably indicative of the changed attitude toward the dental profession on the part of state officials. The honesty, intelligent dis-

crimination and devotion to duty exhibited by most of our present state executives and legislators prove them to be truly worthy of their public trust.

It is difficult to conjecture just what dentistry may accomplish in the next three-quarters of a century with an honest government and its own splendid record back of it. It can do no better, though, I am positive, than to serve humanity with skill, honesty and untiring effort. Its goal is not to be achieved in the one brilliant act of a genius, but rather in the slow, scientific proving of fact from conjecture, to meet again and again ever changing conditions and problems, and never quite to realize the perfect result. Constant striving toward the improved dental and general health of our people will, however, bring results. After all, work in health service calls for men of character and of vision, such men, I feel, as are our dentists.

Today we are happy in the thought that this celebration of our Diamond Jubilee closes an epoch in our Association of the most remarkable advancement that a scientific profession has ever made in so limited a time. The program of this great meeting, the work of the essayists and clinicians, the scientific exhibits, together with an outstanding exhibit on dentistry at the Century of Progress Exposition, demonstrate the importance of dentistry in the world of today. If further proof is needed, one has only to note the presence of those on this platform to be convinced. We can be justly proud that our profession attracts to this meeting the Surgeon General of the United States Public Health Service, a United States Senator, the Mayor of Chicago, the President of the Century of Progress International Exposition and, in addition, physicians and men and women of international prominence in our own profession from every quarter of the globe.

In closing, I desire to express, in the name of the American Dental Association appreciation and thanks to Reverend Carr, Surgeon General Cumming, President Dawes, and Mayor Kelly for their presence here this afternoon and for their participation in this program. I also wish to extend thanks to Dr. Dawson Buckley of London, Dr. Georges Villain of Paris, to my colleagues in the dental profession and to all the officers and committees of the Chicago Centennial Dental Congress, the Chicago Dental Society and the American Dental Association who did so much to prepare this joint program and joint meeting for the success that it cannot fail to have.

Dr. Villain we thank for his kind words and thoughtful generosity. His bringing from Paris and presenting to the American Dental Association a set of eighteen bound volumes of the Proceedings of the Eighth International Dental Congress, which was held in Paris in 1931, is deeply appreciated. It is with pleasure that I accept this gift in the name of the American Dental Association. This present from Dr. Villain, president of the International Dental Federation, is much appreciated, but even more so is the spirit which is manifested in this presentation. This beautiful and useful gift will be placed in the library of the American Dental Association, where I am sure it will be often consulted by our members.

The messages received from Surgeon General Robert U. Patterson of the United States Army and from Surgeon General P. S. Rossiter of the United States Navy are also deeply appreciated, as well as are those from the presidents of the American Medical Association, the Illinois State and Chicago Medical

societies. It is difficult for me to find words to express my personal feeling or to respond adequately for the American Dental Association to the message from President Franklin D. Roosevelt, which was delivered by Surgeon General Cumming. The recognition received by our Association from the Chief Executive of the nation is indeed inspiring and warmly appreciated. May I request you, General Cumming, to convey to President Roosevelt the cordial greetings of the American Dental Association and to express to him our pleasure at his kind and encouraging words. They are deeply appreciated and are received with sincere thanks. I shall ask General Cumming also to convey assurance of the loyal support of 30,000 members of this Association representing every state in the Union, who admire the constructive program so vigorously sponsored by President Roosevelt. We are devoutly thankful that so able, forceful, active and just a man is at the head of this great nation.

[Editor's note.—Following are the messages referred to in Dr. Dittmar's address coming from President Franklin D. Roosevelt, Surgeon General Robert U. Patterson, Major General of the U. S. Army, and the Surgeon General of the U. S. Navy, P. S. Rossiter; also the resolution passed at the meeting and the message telegraphed to President Roosevelt.]

COPY OF THE LETTER SENT BY PRESIDENT ROOSEVELT TO THE SURGEON GENERAL

The White House
Washington

July 28, 1933.

My dear Dr. Cumming:

It is with much pleasure that I extend through you congratulations to all those attending the American Dental Association's Seventy-Fifth Annual Session.

Through individual and organized effort this profession has made wonderful advancement and dentistry is now generallly recognized as one of the most important and necessary divisions of health service.

May I express the hope that this progress will continue and that even further ways of making the dental health service available for all of our people will be found.

I feel that the whole nation should be proud of the expansion of this profession from the standpoint of a social service which is of such major importance to the welfare of our people.

Sincerely yours,

(Signed) FRANKLIN D. ROOSEVELT.

Dr. Hugh S. Cumming,
Surgeon General
United States Public Health Service,
Washington, D. C.

SURGEON GENERAL PATTERSON'S LETTER TO DR. DITTMAR

War Department
Office of the Surgeon General
Washington

August 3, 1933.

Dr. G. Walter Dittmar
American Dental Association
Chicago, Illinois

My dear Dr. Dittmar:

I want to extend to you and through you to the officers and members of the American Dental Association my congratulations on the occasion of the Diamond Jubilee meeting of the Association. You have every reason to be proud on this occasion and I am sure this great meeting will be the inspiration to still greater achievements in health service.

I regret that circumstances prevent my acceptance of your invitation to be present, but I want you to know you have my sincere good wishes for your continued and uninterrupted success.

Sincerely yours,

ROBERT U. PATTERSON
Major General, U. S. Army
The Surgeon General

SURGEON GENERAL ROSSITER'S LETTER TO DR. DITTMAR

July 31, 1933.

My dear Doctor Dittmar:

It is with keen regret that I must forego the pleasure of being with you on the occasion of the Diamond Jubilee of the Am-

erican Dental Association, and I greatly appreciate the honor of your invitation to address you, but the pressure of official business compels me to remain in Washington and prevents my attendance at your meeting.

This year we can look back upon twenty-one years of oral health service performed by the Dental Corps of the Navy. We have seen the original group of thirty officers, authorized by Act of Congress in 1912, grow to its present strength of 186, and I acknowledge gratefully the splendid assistance and support of the American Dental Association that brought about this improvement in our service.

However, we know that much remains to be gained if we are to offer the Navy all that is available to the average civilian, and I am pleased to report that I have urged the increase of personnel of the Dental Corps sufficiently to enable us to achieve and maintain standards of dental fitness on a plane with our high physical standards. We of the Navy look forward to the continued support and recommendation of the American Dental Association in this important health work.

With kindest regards and best wishes for a most successful meeting, I am

Very sincerely yours,

P. S. ROSSITER

Surgeon General, U. S. Navy.

Dr. G. Walter Dittmer, President
American Dental Association
59 E. Madison St.
Chicago, Illinois

RESOLUTION PRESENTED
BY HOMER C. BROWN

WHEREAS, during the past three decades the progress of the dental profession has been greatly accelerated by Federal legislation and regulations, and

WHEREAS, the President has sent a message of greetings and felicitations through the distinguished Surgeon General of the United States Public Health Service, which is a further evidence of the recognition that dentistry is an integral and vitally important phase of health service; therefore, be it

Resolved, that dentistry as represented by the three organizations participating in this, the greatest dental assemblage ever held, officially expresses its grateful appreciation for this stimulating message and commends the courage, the vision, the initiative and the leadership of President Roosevelt in his efforts to reestablish confidence in our citizens as the first step in overcoming the economic cataclysm which has cast such dark shadows over our entire Nation, and be it further

Resolved, that organized dentistry assures the President of its full cooperation and support in all constructive efforts to restore amity, harmony and prosperity in our country at the earliest possible date, and that this resolution be incorporated in the minutes of these organizations and a complete copy be telegraphed to the President of the United States signed by Dr. Arthur D. Black, Dr. G. Walter Dittmar and Dr. Howard C. Miller, presidents of their respective organizations.

The Resolution was unanimously adopted by a rising vote.

THE DEVELOPMENT OF THE DENTAL SERVICE OF THE UNITED STATES ARMY IN THIS COUNTRY FROM APRIL 8, 1917 TO FEB. 12, 1919*

By WILLIAM H. G. LOGAN, M.S., M.D., D.D.S., F.A.C.S., Chicago, Ill.

PRIMARILY, the general purpose of the Past Presidents' Club of the American Dental Association was to grant an annual opportunity to those who had been called on to serve the Association as President to lunch together and exchange personal or professional reminiscences: but, in recent years, the custom has been established of calling on each former President in rotation to present a review of the activities of the profession for the immediate period that he presided over the Association; or, if he saw fit, he might summarize those professional activities of which, perhaps through force of circumstances, he was privileged to have a more intimate knowledge than most of his associates.

Therefore, for the purpose of reviewing past scenes and occurrences, and of placing them in our official files for permanent preservation with the thought that, in another quarter or half a century, they will be of more interest than in the year 1932, I have chosen as my subject, "The Development of the Dental Service of the United States Army in This Country from April 6, 1917 to Feb. 12, 1919."

In the discussion of this general theme, an effort will be made to convey something of the spirit and manner in which the members of the dental profession of the United States sought to perform their duties, not only as dental officers, but also as professional men, during the national emergency. The subject will be discussed under the following divisions: 1. The status of the dental service in the United States Army as of April 6, 1917. 2. The status of the dental service in the United States Army on Nov. 11, 1918, and on Feb. 12, 1919. 3. Contributions made by the dental educational institutions of this country during the period of the World War.

THE STATUS OF THE DENTAL SERVICE IN THE UNITED STATES ARMY ON APRIL 6, 1917

It would seem essential to include a statement concerning the status of the dental service in the United States Army on April 8, 1917, in order that we may more clearly ascertain the progress that was later made in this arm of the service, for it was on this day that our Commander-in-Chief, President Woodrow Wilson, appeared before a joint session of Congress and declared that a state of war existed between this country and the Imperial Government of Germany.

At that time, the records show, the American Army had eighty-six dental officers, eighteen of whom were captains and the remainder first lieutenants. No representative of the Dental Corps had

*Read before the Past Presidents' Club of the American Dental Association, Buffalo, N. Y., Sept. 13, 1932.

ever been assigned for duty in the Surgeon General's Office, or for professional duty in the District of Columbia; yet a very definite need had always existed, it being one of the unattained ambitions of the Dental Corps. Although the annual Transactions of the National Dental Association (as the American Dental Association was called in that day) disclosed reports and intelligent efforts to create a dental corps for the Army and Navy, the law in effect in 1917 permitted our dental officers in the Army to advance only to the grade of major, and this was possible only after such officers had a record of twenty-four years of service. Even then, the number was limited to eight, regardless of how many there might be at any given time who had served the required number of years.

Despite the fact that it was customary for officers in most branches of the military service to receive special military, technical and professional training immediately on their entrance into the Army, this opportunity had never been granted to the members of the Dental Corps previous to the declaration of war. At that time a law existed permitting the creation of a dental reserve corps, but no rules or regulations had been promulgated to organize such a corps until after we had entered the war. While many dentists were eager to enter the Dental Reserve Corps, the early plan pursued made it necessary for an applicant to forward his request to the Surgeon General's Office. The formal application was then furnished, and the applicant advised when the next board was to meet in his own state or in an adjacent one; with the result that many days or weeks might elapse from the time of application until the completed papers were filed for final decision.

In order to obviate or shorten this period of delay, I presented to those in authority in the Surgeon General's Office in June, 1917, a request for permission to designate representative men of the dental profession who, by education and experience, were well qualified to give professional examinations to applicants desiring to be commissioned in the Dental Reserve Corps. This request, although without precedent and most unusual, was granted the following day by Surgeon General Gorgas.

In the twenty-four hours that intervened between the presentation and the acceptance by Surgeon General Gorgas of the plan whereby preliminary dental examiners were to be officially appointed by the War Department, appropriate examiners were selected for each state so that no delay would be occasioned if final acceptance were secured. The men so selected and approved by the Surgeon General as preliminary dental examiners were the deans of the well-recognized dental institutions throughout the United States, the secretary of each state dental examining board, and such additional dentists as the service demanded in certain localities.

In view of the fact that army regulations required that an application to enter any arm of the service should be approved by an officer in that service, all examinations held under the jurisdiction of the preliminary dental examiners were forwarded to Washington for final approval by a dental officer in the Regular Dental Corps.

It is of interest to record that the dental service of the United States Army was the only arm in the military organization that was built up through the aid of preliminary examiners, who gave liberally and gratuitously of their time to assist dentists desiring to enter military service. This was accomplished with

such promptness and efficiency that although only five reserve corps officers had been commissioned in the first two months of the war, by Sept. 8, 1917, or three and one half months subsequent to granting of the authority for appointment of the preliminary examiners, all examinations for general practitioners were discontinued, as the War Department had a sufficient number of commissioned dental officers and completed applications on file for action to care for an army of 5,000,000 men under the quota then authorized by law. In other words, the records show that through the hearty cooperation of the civilian members of the dental profession and the patriotic response of those desiring to enter military service, when war was declared there were eighty-six officers in the Regular Army, five had been commissioned in the Reserve Corps in the first two months of the war, and in the following three and one-half months the number had passed beyond 5,000. Hence, by compliance with every request issued in the name of the Surgeon General, the dental profession was able to accomplish that which was not equaled by any other branch of the military organization, i. e., securing its quota of officers for an army of 5,000,000 in practically three and one-half months. These officers were secured without the holding of a single public meeting, without the presentation of a personal appeal by letter or by voice of any one in this nation, and, in this accomplishment, the dental profession established a record of which it may be justly proud.

Immediately on the declaration of war, arrangements were made by those in charge of the construction of camps and cantonments in this country to have the dental service performed in the camps under canvas, and in the cantonments, through the regimental infirmaries. In both instances, the dental equipment consisted of the field outfit made up of a portable knock-down canvas seat chair, an old style cuspidor and a foot engine, with no laboratory equipment except in the hospitals where one base equipment was supplied.

THE STATUS OF THE DENTAL SERVICE IN THE UNITED STATES ARMY ON NOV. 11, 1918 AND ON FEB. 12, 1919

With the foregoing brief outline of the condition of the service at the declaration of war, and the planning and extension of the dental force to meet the requirements authorized by law for an army of 5,000,000, let us now focus our attention on the status of the dental service at the time of the signing of the Armistice.

If we are to understand the situation as it existed on Nov. 11, 1918, it is necessary that we go back to September 30 of that year, for it was on that date that the Adjutant General, by regulation, granted an increase in the quota of assignment of dental officers from one per thousand to two per thousand. The object of this action was to provide the 9,000 to 10,000 dental officers necessary to care for the 4,500,000 army this Nation had planned to have in the field in France by July 1, 1919. As most of you will recall, continuous effort had been made, since dentists sought entrance as officers in the United States Army, to secure a quota of two dental officers per thousand and have it authorized by law, but without avail. But here we find, by authorization of the General Staff, the granting of that which we had insistently demanded was essential.

Why was it possible at that time to secure the authorization for the assignment of two dental officers per thousand? It was, in part, because our civilian den-

tists, in cooperation with that splendid patriotic organization, the Preparedness League of American Dentists, banded together to assist in making the selective service men dentally fit before their induction into military service. It was also due, in large measure, to the fact that the dental officers in the posts, training camps and hospitals of this country, the base and evacuating hospitals and the field service, and far forward in the line in France, had been tested under most trying circumstances and not found wanting, and their service had proved worthy of every consideration. Hence, our request for authorization for doubling the quota was approved within a very few days.

Oct. 3, 1918, or three days after the authorization for two dental officers per thousand had been secured, examinations were being held in every camp in this country and abroad for enlisted dentists to complete their applications for commissions. A few days later, authorization was granted to dentists who had been placed in Class 1-A by their local board to complete applications for commissions in the Dental Corps of the United States Army. Between Oct. 3 and Nov. 1, 1918, more than 1,500 applications were completed and forwarded to the Surgeon General's Office and 800 or 900 of these had been acted on by the Surgeon General and the applicants recommended to the Adjutant General for commissions in the interim. Of the nearly 1,000 applicants recommended to the Adjutant General, only a very few were granted commissions. Because of the signing of the Armistice, the increased number of dental officers thus provided were not needed, but later they were granted an opportunity, before or after returning home, to accept commissions in the Reserve Corps.

In my opening remarks, I described the plan whereby the dental officers were to perform their duties and referred to their proposed equipment during the early days of the war. Let us now consider the same plan and proposed equipment as of Nov. 11, 1918. Instead of the eighty-six dental officers on duty, we had between 5,000 and 6,000, with a grand total of 9,000 or 10,000 who had accepted commissions. At a number of camps and cantonments in this country, two dentists per thousand were at work in specially constructed dental infirmaries which accommodated from twenty-five to forty dental equipments, composed of the usual base chair, with which you are all familiar, fountain cuspidor, electrically driven dental engine, steel cabinets, electrically heated spray outfit, complete laboratory equipment, an excellent roentgenographic outfit and a dark room for developing films —a more complete dental equipment than is possessed by many civilian practitioners of that or this day. The dental officers abroad had base equipment in certain centers, but in the main they relied on field equipment in the active zones.

CONTRIBUTIONS MADE BY THE DENTAL EDUCATIONAL INSTITUTIONS OF THIS COUNTRY DURING THE PERIOD OF THE WORLD WAR

In the belief that a comprehensive understanding of the dental situation in the United States Army from the declaration of war until the signing of the Armistice is not possible without a review of certain additional points, your attention is invited to the fact that, in May and June, 1917, a majority of the dental schools of this country instituted gratuitous courses of special instruction for applicants desiring to enroll in the Dental Reserve Corps. The courses,

which were approved by the Surgeon General, were of a nature to better qualify the attending dental officers in field and hospital service. It is conservative to state that probably between 4,000 and 5,000 dentists attended these courses of instruction without expense to themselves or to the government. The educational institutions were officially thanked for their contribution.

June 15, 1917, the Surgeon General approved the organization of a section on surgery of the head, the officers of which, among their other duties, were charged with securing well-trained men specially qualified to care for diseases and injuries of the brain, eye, ear, nose, throat, face and jaws. The commissioned personnel of the Surgical Head Unit consisted of one specialist each for brain, eye, ear, nose and throat diseases, one plastic or oral surgeon and one dental oral surgeon competent to care for cases of fracture, impaction and the pathologic conditions to which the teeth and jaws are subject. I have always looked on the inclusion of a competent dentist in this unit not only as beneficial to those soldiers needing the care of the Surgical Head Unit but also as very definitely increasing the respect with which the dental profession was held by the outstanding authorities in this particular field, as well as by the medical profession in general, and, more particularly, by the commanding officers in charge, who, in practically all cases, were Regular Army representatives.

Oct. 15, 1917, by the authority of the Surgeon General, and under the direction of the subsection of plastic and oral surgery of the Surgical Head Unit, courses of instruction in plastic and oral surgery were instituted at Washington University Dental School, St. Louis; Northwestern University Dental School, Chicago, and the Thomas W. Evans Museum and Dental Institute, Philadelphia. At these institutions, the medical and dental officers were given special instruction in bone fragment fixation by the use of intra-oral splints, in the systemic effect of focal infection and in surgical anatomy of the face, jaws and neck. These courses were discontinued about March 1, 1918, for the reason that, on March 15, 1918, a school for dental officers was instituted at Camp Greenleaf, Chicamauga Park, Fort Oglethorpe, Georgia, in connection with the Medical Officers' Training Camp for military and professional instruction of dental officers and their authorized assistants. When the Armistice was signed, more than 1,200 dentists were in that school receiving either military or professional training.

The duration of the general course of instruction for the dental officers was two months. The first month was given over to 180 hours of general military training, and the second to seventy hours of special military training. In addition, 110 hours were devoted to professional subjects having a definite relation to the general practice of dentistry as it should be conducted in the army. The training in this officers' camp was of such a character that both the physical and the professional efficiency of those attending was greatly enhanced. Furthermore, as far as I know, this was the only country giving such extensive training in military and professional subjects to dental officers and their authorized assistants.

As chairman of the Dental Committee and as a member of the General Medical Board, Council of National Defense, I often had occasion to call the entire membership of the Dental Committee, as well as the deans of the well-recognized dental institutions of this country, to Washington for conference. In July,

1917, at one of these meetings, there was formal discussion of the question of the enrollment of dental students in the enlisted Reserve Corps of the Medical Department for the purpose of permitting them to be assigned to an inactive status until their graduation. At this conference, a subcommittee was appointed with power to act, and although educational propaganda was officially carried forward by the deans and other members of the teaching staff, and by the students concerned, as well as by many of their patients, those in close touch with the problem had reached the conclusion that their arguments in justification of this claim were not sufficiently convincing. As a result of such failure, and without the knowledge of any dean representing the National Faculties Association or of any officer of the National Dental Association not in military service, or of any member of the Legislative Committee of the National Dental Association, an amendment was attached in the Senate to the Dental Bill enacted on that day, which specified that "All regulations concerning the enlistment of medical students in the enlisted Reserve Corps and their continuation in their college courses while subject to call to active service shall apply similarly to dental students."

As I have never seen in print or heard this question publicly discussed, I believe it would be of interest to relate the details of the above-mentioned action.

About 9 o'clock on the morning of Oct. 6, 1917, two representatives of the Senate and one of the House appeared at my desk in the Surgeon General's Office to ascertain whether it was my opinion that any ill effects would accrue to the Army or to the public needs if legislation were not provided whereby the dental students would be granted the same privilege of continuing in their studies as had been accorded to the medical students. Otherwise, they would be called on to proceed to the camps when their numbers were reached by the various conscription boards, in quite the same manner as students in law, theology, engineering and the arts and sciences were conscripted. My reply was that, in my opinion, we could only safely consider the dental needs for an army of not less than 10,000,000 men in the ultimate, and furthermore, if the dental requirements of such an army were to be properly met, all important reparative work should be accomplished during the few months that the conscripted men were in training in our camps in the United States. For this purpose, we would need an assignment of two or three officers per thousand, and not to exceed one per thousand for the men in the field in France. To state this concisely, these representatives were informed that the best interests of the Army would be ultimately served if there was a minimum of two dental officers per thousand for the probable maximum strength of the Army. However, our department was of the opinion that not more than one officer per thousand could be assigned for a number of months to come, even though regulation authorizing two were granted, for the very practical reason that dental equipment was not available and it could not be made so for another six months.

At the end of a fifteen or twenty minute conference, the three representatives of Congress were in agreement that the dental students should be accorded treatment similar to that provided by law for the medical students. They advised me that they would then proceed from my office to that of Surgeon General Gorgas and Secretary of War

Baker, and thence to Provost Marshal General Crowder, for their approval of the management of this question regarding dental students. I then suggested that if, in their opinion, there would be no delay caused in the handling of the entire question, I felt very certain that the dental service of the United States Army would be benefited if the proposed dental law then before the Senate, having been previously acted on favorably by the House, could have this amendment attached to it, and both go forward on that, the closing day of Congress.

Immediately after asking that this amendment be attached to the dental bill, they expressed uncertainty as to whether those whom they represented would favor the final day of Congress as an appropriate time for consideration of the dental bill. But since there seemed to be a reasonable doubt in their minds as to just what would be the best procedure, I asked whether it would simplify matters if I left the room so that they might discuss the question privately, and their reply was "It might be helpful." About ten minutes later, I was invited back to my office and informed that, although they had reached the decision that it would be appropriate to attach the amendment to the dental bill in question and make an effort to have them both enacted into law during that day, they would have to discuss the question with General Gorgas, and that if it met with his approval they would include this request when they appeared before Secretary of War Baker and General Crowder.

Before leaving, they requested that I should not reveal the personnel of their committee, but this request was not meant to infer that I should not discuss their call or the purpose of it. With this declaration, the Congressional Committee took their departure. In a few minutes, I was called into conference by General Gorgas, in the presence of the committee, with regard to certain details of the question under discussion, at the end of which General Gorgas gave his full approval to the effort toward the passage of the dental bill and the attaching thereto of the amendment providing that dental students be treated with a consideration similar to that which had already been extended to medical students.

When the Congressional Committee had left the Surgeon General's Office and proceeded to the office of Secretary of War Baker, I promptly inquired of General Gorgas whether he thought that it would be unwise or inappropriate for him to get into telephonic communication with Provost Marshall General Crowder to gain his approval of the proposed amendment. As one of his characteristic smiles passed over his face, he said "That's a good idea, Colonel, but I obtained that before I sent for you, and, in addition, have we not both discussed this question with General Crowder before?" to which I had to answer in the affirmative, but I was surprised that General Gorgas was aware of this.

I believe the foregoing presents the essential details of an occurrence that resulted in a happy termination of the intelligent and outstanding efforts that had been made not only by the leading members of the dental profession, but also by the officers and legislative committee of the National Dental Association in the years 1917 and 1918. In this connection, I also wish to pay tribute to the important part played by Dr. Emory A. Bryant for his assistance in aiding the dental legislation of that period.

Before dismissing the question of dental

legislation of the year 1917, and its varied ramifications, I desire to express the opinion that had it not been for the attachment of the amendment to this bill which specified that "all regulations concerning the enlistment of medical students in the Enlisted Reserve Corps and their continuance in their college courses while subject to call to active service shall apply similarly to dental students," the bill that provided that "hereafter the Dental Corps of the Army shall consist of commissioned officers of the same grades, proportionately distributed among such grades as are now, or may be hereafter, provided by law for the Medical Corps" would not have been passed on Oct. 6, 1917, which was the last day of that session of Congress. However, the conclusion should not be drawn that I did not feel that favorable action on this very same bill would probably have been reached in a subsequent Congress, because of the merit and justness of its demands, and the splendid efforts that had been put forth by all concerned to bring about a desirable end.

Within thirty days after the signing of the Armistice, I was of the opinion that my assignment in the Surgeon General's Office could be appropriately discontinued. Therefore, I made a formal request in writing that I be permitted to return to Chicago, or be granted the opportunity of a tour of the important face and jaw hospitals located in England, France and Italy. Much to my surprise, Surgeon General Ireland explained that there were important duties yet to be performed which had to do with the unwinding of the army machine and which, in his opinion, were as important and as difficult as its building-up. Also, many conferences would have to be held to maintain the positions taken by the various department heads if the Table of Organization, as then agreed on by the War College, was to be brought into permanent form through legislative enactment. Therefore, I complied with the Surgeon General's request and remained in the service until Feb. 12, 1919.

I herewith take the liberty of closing this phase of my presentation by saying that it was my firm conviction when I ceased duty in the Surgeon General's Office at Washington that the powers that be in the Offices of the Surgeon General, the Chief of Staff and the Secretary of War had reached the decision to concur in the desire of the Dental Corps and the dental profession that the assignment of two dental officers per thousand be allowed thereafter in any army that represented the United States of America. I believed that the authorization of two dental officers per thousand would then be written into law without an appeal from the members of the Dental Corps, or of the dental profession at large, and the evidence upon which that was based may be found in the *Army and Navy Journal,* Jan. 18, 1919, page 713. One will find there recorded the fact that Newton D. Baker, Secretary of War, and General March, Chief of Staff, appeared before the Military Committee of Congress and approved a bill for the reorganization of the army which included the quota of two dental officers per thousand.

A table of organization, specifying in detail the number of dental officers to be assigned at all stations, together with their grades, had been approved. Furthermore, it was my opinion that officers of the Dental Corps would be on duty at all times in the Surgeon General's Office, looking after the interests of the Corps under the direction of the Surgeon General, and that this would be continued without the request of any member of

the Dental Corps or of the profession; and I am pleased to say today that this latter prediction has become a fact. The Surgeon General of that time fully approved the establishment of a Dental Officers' Post Graduate Training School in connection with the Army Medical School at Washington, D. C., in close proximity to the Walter Reed General Hospital.

In an official communication sent to the officers in charge of the various camps and cantonments on the day I ceased military service, the following paragraph was included:

> I believe the most ambitious hopes for the future welfare of the Dental Corps will be realized in a year or two at the most, for in that period I have faith that the quota of two per thousand will be authorized by law with the approval of the War Department. I predict that a postgraduate school will be established where all members of the Dental Corps will receive instruction at regular intervals; that full dentistry will be established in the Army; that complete dental equipment will be found at all permanent stations and that there will never be a time in the future when the District of Columbia will not have competent dental officers rendering dental service to those authorized to receive it, in quite the same manner as medical officers have always been stationed in the District of Columbia.

Time has proved the correctness of most of the foregoing prophecies, and in this there is much gratification for all concerned. Although an effort has been made to give recognition where credit seems to be appropriately due, this historical sketch should not be closed without expressing appreciation to those in authority in the Surgeon General's Office, and to the Chairman of the General Medical Board, Council of National Defense, as well as to the administrator in charge of the assembling of the conscripted army, for if these men had not been in hearty accord with all forward movements, the progress and growth of the dental service of the United States Army would have been far slower. Furthermore, it would seem that, in the future, not only should our profession, on all occasions include the names above referred to, but that equal emphasis should be given to the aid rendered by Major General William C. Gorgas, Major General Merritte W. Ireland, Major General Enoch Crowder, Brigadier General Robert E. Noble, Colonel Franklin H. Martin, Colonel Reuben B. Miller, and Lt. Colonel John S. Coulter, for if any of these officers had been antagonistic, or even indifferent, to the worth and requirements of the dental profession during this emergency, many of the things here described could not have been recorded as accomplishments.

It seems fitting that the final word should be one of congratulation to the members of the Regular Dental Corps of the United States Army. If these officers had not accepted their rapid promotions and new responsibilities with modesty, appropriate judgment and diplomacy, the status of the Dental Corps and the standing of American dentistry in the eyes of the American Army, as well as in military circles of all nations, would have been greatly injured; and because of this, the members of the civilian profession of the United States should extend most sincere praise and words of approval to our worthy and distinguished representatives in the Regular Dental Corps of the United States Army for the important part they played in advancing the status of dental service during the World War.

A PRELIMINARY REPORT ON THE ZINC PHOSPHATE CEMENTS*

By GEORGE C. PAFFENBARGER,† D.D.S.; W. T. SWEENEY,† A.B., and AARON ISAACS,‡ B.S., Washington, D. C.

FOREWORD

THIS preliminary report on the zinc oxide cements is given at this time to show the progress that is being made by the Research Associates of the American Dental Association at the National Bureau of Standards. In its present form, this article should be of considerable help to those using this material. Before the work is completed, items such as setting temperature, solubility, adhesion and density will be studied. When the study is completed, a specification for zinc oxide cements will be formulated which should insure an article to be of value for the specific use for which it is intended.

Until these specifications are adopted by the American Dental Association, it is not deemed advisable by the Research Commission to publish the names of the manufacturers in the report of properties studied. Instead a code letter is given. Should the dentist wish to identify the particular cement that he is using, he should write to the manufacturer, who will have had his own product identified to him by the Research Associates at the Bureau of Standards.

After the specifications are completed and adopted by the American Dental Association, the names of all manufacturers whose materials pass the specifications will be published in a supplemental report.

This policy, as in the past, will be followed in the future in the reports of any materials studied by the Research Associates.

EXECUTIVE BOARD,
RESEARCH COMMISSION.

An investigation of the zinc phosphate cements by the cooperative dental research between the National Bureau of Standards and the American Dental Association was initiated this year after the completion of the work on amalgams, inlay golds and accessory materials.

This work was undertaken to determine: (1) what physical and chemical properties are essential in the zinc phosphate cements as far as their dental service is involved; (2) what instruments and methods would be satisfactory for determining these properties; (3) whether the manufacturers' technics for using these materials are adequate and accurate; and (4) whether a reasonable specification can be written which would insure

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†Research Associate of the American Dental Association at the National Bureau of Standards.

‡Associate Chemist, National Bureau of Standards.

the dentist a reliable guide in the purchase of these cements. As was anticipated, progress has been slow. Much time was consumed in determining what tests would be significant and in developing a method for preparing satisfactory test specimens.

No systematic attempt was made to develop new cements, or even to perfect the present ones; nor were manufacturing processes or methods of fabricating these cements studied.

chemical composition, dimensional change on setting and solubility. At the present time, several dental school laboratories have interested themselves in this problem and the future of the literature on cement seems promising.

MATERIALS INVESTIGATED

All materials on which subsequent data were determined were purchased in the open market from reputable dental retailers. The trade brand names are arranged alphabetically in Table 1.

TABLE 1.—MATERIALS INVESTIGATED

Trade Brands	Manufacturer's Designation	Manufacturer
Ash's	Oxphosphate of zinc	Claudius Ash Sons & Co., Ltd.
Ames	Crown and bridge cement	The W. V. B. Ames Co.
Brewster	Crown and bridge and inlay cement	E. R. S. Brewster
Caulk	Crown and bridge cement	The L. D. Caulk Co.
Dunn's	Non-sodium cement	J. Austin Dunn Specialty Co.
Fleck's	Extraordinary cement	The J. R. Stanley Chemical Co.
Garhart	Crown-bridge-inlay cement	Garhart Dental Specialty Co.
Harvard	Cement	Richter & Hoffman
Holloway's	Oxphosphate-zinc cement	I. A. Holloway
Improved	Crown and bridge cement	The J. Bird Moyer Co.
Ionic	Crown and bridge and inlay cement	Young-Baker & Co.
H. D. Justi's	Insoluble cement	H. D. Justi & Son
Kryptex*	Translucent cementing medium	The S. S. White Dental Mfg. Co.
S-C	Zinc cement	Stratford-Cookson Co.
Smith's	Cement	Lee S. Smith & Son Mfg. Co.
S. S. White	Oxphosphate-zinc cement	The S. S. White Dental Mfg. Co.
Zurcon	Cement	Zurcon Chemical Co.

*This cement is of a different type and contains only a relatively small amount of zinc oxide. It closely resembles the silicates. It is included since it is recommended as a cementing medium.

AVAILABLE LITERATURE

The published literature on cements is conspicuously lacking in reliable data on the physical and chemical properties. Several publications[1] have been of assistance in this inquiry.

Several of these valuable contributions have emanated from the research laboratories of the manufacturers. Most of the papers are very vague regarding certain of the most important properties, such as

1. Fleck, Herman: Chemistry of Oxyphosphates, D. Items Int., 24:906-935 (Dec.) 1902. Poetschke, P.; Physical Properties of Dental Cements, J. Indus. Eng. Chem., 8 (April) 1916; 15 (April) 1923. Souder, Wilmer, and Peters, C. G.: Investigation of Physical Properties of Dental Materials, Bur. Stan. Tech. Paper No. 157, 1920, p. 29-30. Ward, M. L.: American Text-Book of Operative Dentistry, Ed. 6, Philadelphia: Lea & Febiger, 1926, pp. 522-537. Crowell, W. S.: Physical Chemistry of Dental Cements, J.A.D.A. 14:1030 (June) 1927.

In cases wherein the manufacturer supplies more than one type of liquid, the medium or normal setting one was always procured. Most of the powders were of the lighter shades.

considered was how to proportion the powder and liquid to be used in the mix. The powder was easily proportioned by weighing and was stored in ordinary gelatine capsules. Weighing the liquid was

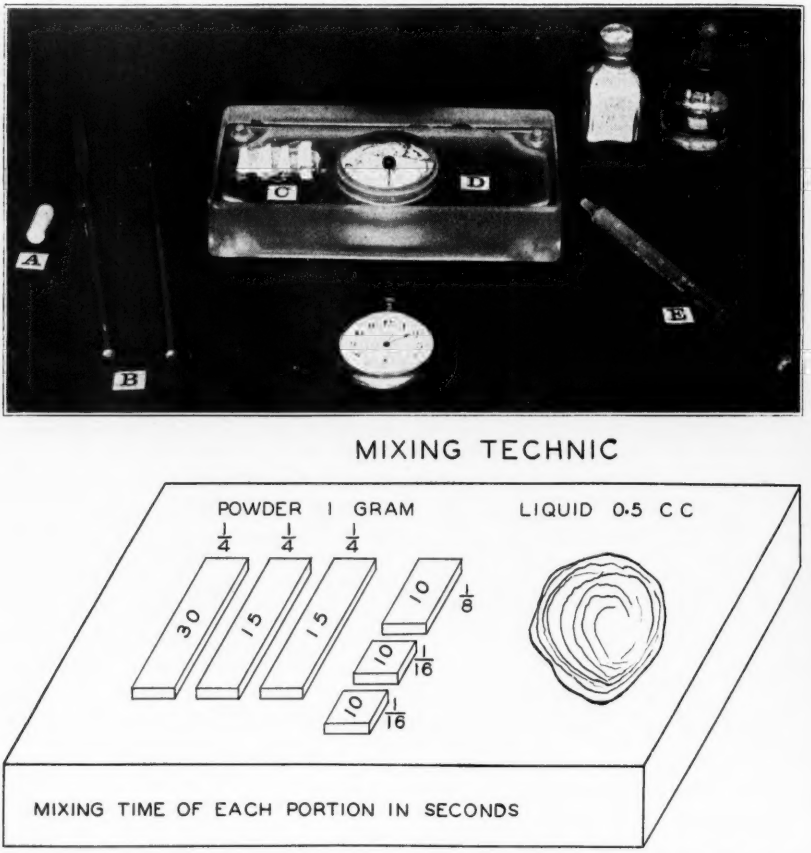

Fig. 1.—Arrangement of material for making standard mix. *A*, capsule of powder; *B*, spatula; *C*, powder; *D*, liquid; *E*, hypodermic syringe.

PREPARATION OF TEST SPECIMENS

A standardized method of preparing test specimens was necessary that they might be uniformly made by the research workers and by outside laboratories.

Powder: Liquid Ratio.—The first item attempted, but was found to be unsatisfactory. The liquid would have had to be weighed upon a large glass mixing slab, as it could not be successfully transferred to it later. The amount of liquid to be weighed would be only a small

fraction of the weight of the glass slab. This gives large errors in weighing the liquid.

Volume measurements were tried. A standard buret proved unsatisfactory for this purpose, as the liquids had such varied surface tensions that the amount of material delivered from the same buret varied for different liquids. A hypodermic syringe of 1 c.c. capacity with its barrel and piston of glass of dissimilar color proved satisfactory. It ejected practically the same amount of liquid each time, did not contaminate the liquid and could be easily cleaned. Also, the method was a very rapid one. The latter is an important detail when several hundred specimens must be prepared. The foregoing method of proportioning the powder and liquid is so practical that it can easily be utilized in routine dental office practice.

The second item was the actual powder-liquid ratio to be used in the mix. In only two instances (Brewster and Harvard) were the manufacturers' directions which accompanied the packages explicit in this matter. One contained a small spoon with the advice to "Fill cup full, scrape off level and place on clean dry slab. Place on slab eight drops of the liquid." The actual amount of powder discharged from the spoon would, of course, vary considerably, depending

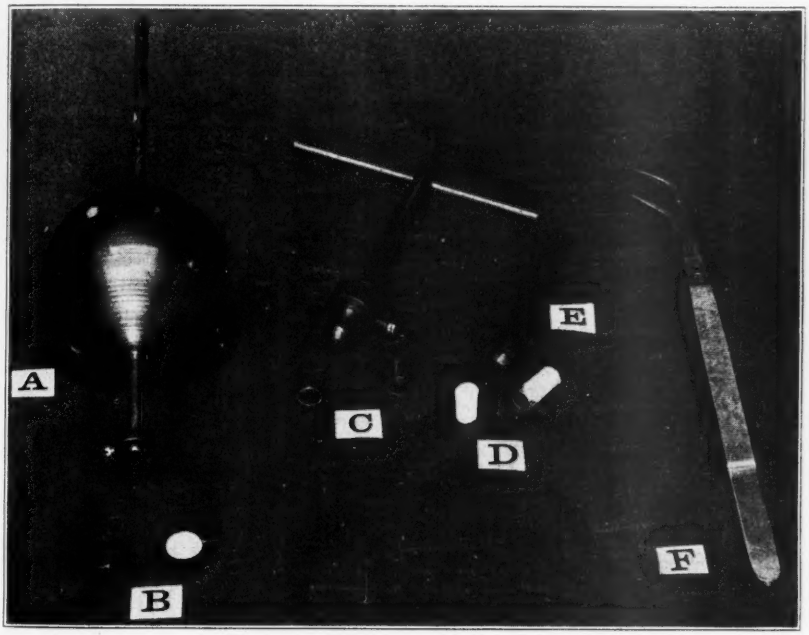

Fig. 2.—Instruments used for preparing setting time and dimensional change specimens. *A*, Gilmore needle; *B*, ring for setting time specimen; *C*, celluloid capsules and length gage; *D*, interferometer specimens; *E*, rod with countersunk end to shape top of specimen; *F*, cotton pliers for handling specimens.

on how the spoon was filled and leveled off. This easily varied between 0.75 and 1.10 gm. Eight drops of the liquid discharged from the dropper accompanying the package amounted to approximately 0.20 c.c. The other directions stated ". . . for setting inlays, crowns, bridges and regulating bands—the proportion should be about: 2 parts liquid to 3 parts powder (both by weight)." This required about 0.20 c.c. of liquid for 1 gm. of powder. These proportions seem too heavy for the proper seating of dental appliances.

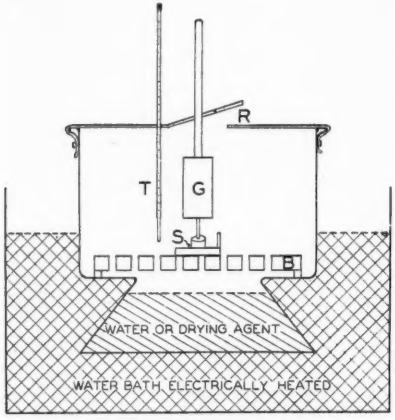

Fig. 3.—Apparatus for determining setting time at controlled temperature and humidity. *R*, window in rubber cover; *T*, thermometer; *G*, Gilmore needle; *S*, specimen; *B*, dessicator plate.

The instructions accompanying the other cements left the proportioning entirely to the dentist. Therefore, visitors to the laboratory were asked to mix their favorite and other brands of cement. In these mixes, measured quantities of liquid and powder were placed upon the slab, the powder portion ample for a very heavy mix. After the mix was completed, the unused powder was weighed and subtracted from the original amount. These mixes were made by private practitioners, members of the Army Dental Corps, members of the dental division of the United States Public Health Service and manufacturers' representatives. The results are shown in Table 2.

The proportion of 0.5 c.c. of liquid for 1 gm. of powder was arbitrarily chosen for this work. This is the proportion used throughout the paper unless otherwise noted. Before a satisfactory specification can be written, some method should be devised whereby the powder and liquid will be proportional for each cement. In other words, a standard testing consistency must be worked out which will closely approximate the consistency used in dental practice. This was relatively simple in the case of the inlay investments, but these cements present a much more complex and difficult problem.

Temperature and Humidity. — The rate of reaction between the liquid and powder is, of course, altered by the temperature at which the mix is made. Six manufacturers specify the slab temperatures. These range from 50 to 70 F. The remainder ignore this point.

As demonstrated later in this paper, the effect of humidity has been overemphasized. Most of the difficulties are from high humidities which cause sweating of the slab when it is chilled to the desired temperature. It is true that the cement liquids are hygroscopic, but the time interval between the deposition of the liquid on the slab and the completion of the mix is short in the ordinary practical case. The mixes were made in a constant temperature and humidity room at 70 F., with a relative humidity of 65 per cent, unless otherwise noted.

Time of Spatulation.—Two manufacturers mention the spatulation time. One prescribed the limits of one to one and a

quarter minutes, the other recommended dividing the powder into five or six portions, each to be spatulated for thirty seconds. In this investigation, one and one-half minutes was used for all mixes unless otherwise specified.

TABLE 2.—MIXING TECHNIC*

Trade Brands	Powder Used Grams	Mixing Time Min.	Sec.	Co-operator
Ames	1.30	3	05	A
Ames	0.90	1	25	B
Ames	0.84	1	25	C
Caulk	0.70	1	45	B
Caulk	0.77	1	20	C
Caulk	1.00	1	25	H
Caulk	1.23†	1	25	H
Caulk	0.65	3	20	I
Caulk	0.72	1	00	J
Caulk	0.70	1	30	K
Fleck's	1.20	1	45	C
Fleck's	0.72	2	20	D
Fleck's	1.00	3	10	E
Fleck's	1.15	3	00	I
Fleck's	0.90	1	20	J
Fleck's	0.96	1	30	K
Moyer	0.75	1	30	B
Smith's	1.10	2	10	A
Smith's	0.75	1	25	C
S. S. White	1.30	2	00	A
S.S. White	1.05	1	30	B
S. S. White	1.28	1	40	C
S. S. White	1.12	2	40	E
S. S. White	0.85	2	30	F
S. S. White	1.12	2	15	G
S. S. White	1.08	3	00	I
S. S. White	1.00	1	40	J
S. S. White	1.00	1	40	K

* 0.5 c.c. of liquid used in all mixes.

† Considered by cooperator as mixing consistency for filling.

Rate of Powder Incorporation.—The reaction between the liquid and powder can be controlled to a considerable extent by the amount of powder drawn into the liquid at any one time. It was therefore necessary to specify exactly how this was carried out. Very few of the directions touched this point other than to caution the operator against drawing large portions of the powder in at one time and to suggest that the first and second or third additions be relatively small. In this study, the weighed powder, having been deposited on one end of the glass slab, was shaped into a square of uniform thickness by the spatula. It was then divided into approximate quarters. The quarter nearest the liquid was subdivided into halves. One of the eighths was again halved. A portion of the powder representing one sixteenth was drawn into the liquid and mixed for ten seconds. This was repeated, the other one sixteenth portion being used, followed by the one eighth portion. Thus, thirty seconds were consumed. The second one-quarter was then added and spatulated for fifteen seconds, the third quarter likewise. The remaining quarter was then added and spatulated for the remaining thirty seconds. Figure 1 (below) shows this graphically.

The mixes were made on glass slabs approximately 6 by 3 inches. Nearly one half of the total area of the slab was used in making the mix. No crumbs of powder or unused liquid were allowed to collect on the edge of the mix. Every portion of powder was thoroughly incorporated. A rotary motion of the spatula, with light pressure in combination with a scraping motion, which would pick up the cement and deposit it in a heap, were used intermittently. In spreading the mix over a relatively large area of the slab, heat from the cement is dissipated in the slab and the temperature is kept to a minimum.

Unless otherwise noted, the foregoing procedure was used in making all mixes on which data were obtained.

COMPOSITION

Chemical analyses were made that the physical properties might be linked directly with the chemical composition. It should be noted that chemical composition in itself is not sufficient to establish definitely the properties of a cement. Many other factors become important, once the formula has been fixed, certain of these, besides composition, being the uniformity of the raw products and their treatment, the temperature to which the material is heated and the chemical reaction taking place during the heating, and the uniformity of the final product and its degree of fineness.

The analyses of the sixteen zinc phosphate cement powders are given in Table 3. From the table, it is seen that these powders are classified roughly into three different types. The first class may be called practically pure zinc oxide. Except for coloring matter, the only other ingredients are probably accidental. The second class is a binary mixture of zinc oxide and magnesium oxide in the approximate proportion of 10:1. Here again, except for small amounts of coloring matter, only accidental impurities are present. The third class is more complex than either of the two mentioned above. Here, in addition to the zinc oxide and magnesium oxide, there are other constituents, intentionally added. Attention is drawn particularly to the presence of such substances as bismuth oxide, silica, barium sulphate, boric oxide and calcium fluoride. Unless chemical composition has little marked influence on the properties of a zinc phosphate cement, it is difficult to understand how all these different types of dental cements can have the same properties. Some should be markedly superior to others.

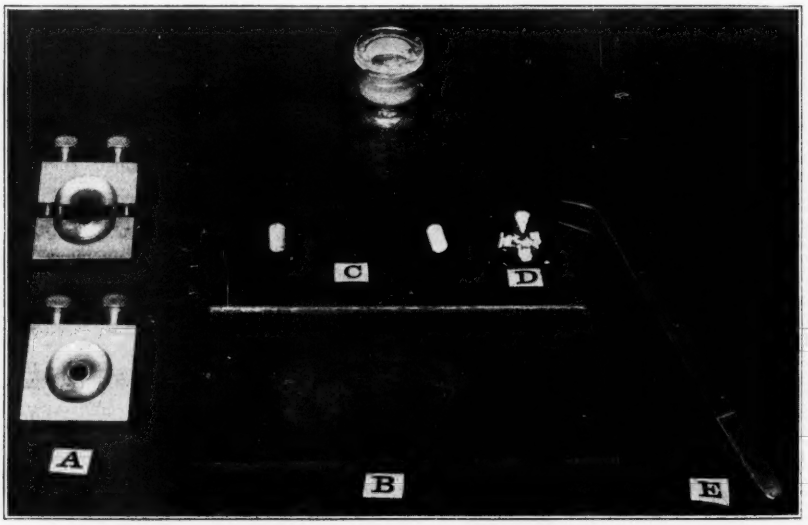

Fig. 4.—Instruments for preparing crushing strength specimens. *A*, metallic molds; *B*, glass plate charged with carborundum; *C*, hard rubber molds and specimens; *D*, crushed specimen; *E*, cotton pliers. Each scale division equals 10 microns.

There was also analyzed along with the sixteen samples of zinc phosphate cement another cement, which is added to this group only because the material is recommended for the same purpose. While the average zinc phosphate cement powder consists mainly of zinc oxide, this powder contains less than 10 per cent of zinc oxide, the main constituents being silica, aluminum oxide and fluorides. Its composition is much more complicated than that of the zinc phosphate cements and it is not to be classified as such.

Table 3.—Composition of Zinc Phosphate Cement Powders
(Percentage by Weight)

Sample	ZnO	MgO	SiO_2	R_2O_3	Bi_2O_3	Miscellaneous
A	100.0	.....	0.05	0.05	.....	
B	99.7	.....	0.1	0.1	.....	CaO, 0.1
C	98.0	.....	.....	.....	1.9	
D	99.4	.....	0.6	0.1	0.04	
E	92.4	7.5	0.1	0.06	.....	CuO, 0.1
F	90.3	8.2	1.4	0.1	.....	
G	90.2	9.4	0.4	0.07	.....	
H	89.9	9.1	0.4	0.5	.....	
I	89.5	9.4	0.3	.....	.....	$BaCrO_4$, 0.8
J	89.3	9.4	0.3	0.1	.....	CuO, 0.02; $BaCrO_4$, 1.0
K	88.0	9.4	0.8	.....	1.8	
L	89.1	4.0	1.8	0.5	4.5	
M	82.2	9.0	3.0	0.9	4.1	CuO, 0.8
N	83.1	7.2	0.1	0.04	.....	$BaSO_4$, 8.2; BaO, 1.3
O	84.0	7.2	4.9	1.0	.....	CaF_2, 2.7
P	74.9	13.0	1.3	2.6	.....	CaO, 2.2; B_2O_3, 5.1
Q	9.4	.....	36.5	26.3	.....	F, 12.0; Ca, 5.9; Mg, 0.5; Na, 4.6; P_2O_5, 3.2; ignition loss, 6.9

Table 4 gives the analyses of the corresponding liquids that are mixed with the powders to make the cement. The first four columns give the chemical analyses of the liquids. From these results were calculated the other figures given in the table. In order to obtain the values for the free phosphoric acid, it was assumed that all the neutralizing elements combined to form a neutral salt, the amount of which is given in the column headed "phosphate." The column headed "total phosphoric acid" gives the amount of phosphate present calculated as phosphoric acid. The columns headed "free phosphoric acid (H_3PO_4)" and "combined phosphoric acid" indicate the amount of unneutralized acid and the amount of acid that has been neutralized by the addition of aluminum hydroxide and zinc oxide.

It is impossible to classify the liquids except to say that they all are phosphoric acid solutions partially neutralized by the addition of aluminum hydroxide and, in some instances, by the addition of both aluminum hydroxide and zinc oxide. Because of the fact that these liquids cannot be readily classified into types, as in the case of the powders, the liquids are placed in the table to correspond with the

powders given in Table 4; that is, liquid A is the liquid supplied by the manufacturer of powder A, and so on throughout the table. Here again are noted wide variations in the composition of the liquids used to mix with powders of practically the same composition. For example, of the four samples of liquid used with the four zinc oxides, the variation of free phosphoric acid is from 41.6 to 56.8 per cent, while the total PO_4 content varies from 55.2 to 64.3 per cent, and the buffer salts, from 12.2 to 29.2 per cent.

TABLE 4.— COMPOSITION OF ZINC PHOSPHATE CEMENT LIQUIDS (PERCENTAGE BY WEIGHT)

Sample	Analysis				Calculations			
	PO_4	Al	Zn	Mg	Free H_3PO_4	Combined H_3PO_4	Total H_3PO_4	Phosphate
A	57.4	1.8	10.0	.....	42.8	16.6	59.4	27.8
B	55.2	3.4	3.1	.....	41.6	15.5	57.1	21.5
C	64.3	2.7	.....	.....	56.8	9.8	66.6	12.2
D	57.3	2.1	10.0	.....	41.7	17.6	59.3	29.2
E	64.6	2.7	1.6	.....	55.5	11.4	66.9	15.4
F	52.6	2.5	7.1	.....	38.2	16.2	54.4	25.3
G	59.9	2.9	2.0	.....	49.4	12.6	62.0	17.0
H	59.7	2.1	4.1	.....	50.1	11.7	61.8	17.6
I	57.9	2.8	.....	0.3	48.9	11.0	59.9	13.7
J	61.1	2.8	.....	.....	53.1	10.2	63.3	12.7
K	64.0	3.2	.....	.....	54.7	11.6	66.3	14.5
L	64.2	2.7	0.9	.....	55.8	10.7	66.5	14.0
M	67.2	3.0	.....	.....	58.7	10.9	69.6	13.6
N	64.9	2.9	.....	.....	56.6	10.6	67.2	13.1
O	54.6	2.3	10.3	.....	37.8	18.7	56.5	30.7
P	53.4	2.7	.....	.....	45.5	9.8	55.3	12.2
Q	47.9	1.9	4.4	.....	38.3	11.3	49.6	17.3

SETTING TIME

Importance to Dentist—The property of setting time is a most important one in the practical use of these cements. Sufficient time must elapse between the mixing and setting of the cement to allow for the placement of the appliance. A cement which sets extremely fast often produces a rough and granular mix and develops considerable heat. For these reasons, extensive tests were conducted on this property.

The setting time of a cement made of zinc oxide and phosphoric acid is very short, as the material reacts quickly. The makers have lengthened this reaction by calcining the zinc oxide and by a partial neutralization of the phosphoric acid in the liquid. This reaction time can be still further lengthened by the manipulation of the cement by the dentist. By the addition of a very small portion of cement to the liquid and long continued spatulation, the liquid is further neutralized, which gives a slower reaction, a slower setting cement resulting.

Method of Determination. — Mixes were made, using the standard procedure as outlined earlier in the paper. A brass ring three-eighths inch in diameter and three-sixteenths inch high was filled with the soft cement. (Fig. 2.) A Gilmore needle weighing 1 pound and having a point one-twenty-fourth inch in diameter

was used to determine the setting time. (Fig. 2.) The needle was lowered vertically until the surface of the cement was touched. The contact was made for five seconds under the full weight of the needle. When no indentation on the cement surface was discernible, the cement was considered set. The setting time was therefore the interval between the commencement of the mix and the completion of the set. The time of set is reported to the nearest minute and was reproducible to plus or minus 10 per cent. For this test, it is absolutely essential that all of the apparatus be clean; especially, that they shall be free of all particles of set cement.

Data Reported.—The effect of various factors including mixing technics, temperature and humidity, powder: liquid ratio and color were determined.

Effect of Temperature of Setting Environment.—In column 1, Table 5, are shown the setting times of the cements which were allowed to set at room temperature and humidity (70 F., 65 per cent relative humidity).

In normal oral use, the cements are mixed at room temperature and then inserted in an environment having a temperature of approximately 98.6 F. and a relative humidity near the saturation point. Additional tests were conducted simulating these conditions. They are reported in column 2, Table 5.

The apparatus used to provide these surroundings consisted of a desiccating jar partially immersed in a water bath. The lower compartment of the jar was filled with water. The ground glass cover was removed and a rubber sheet substituted. This sheet was provided

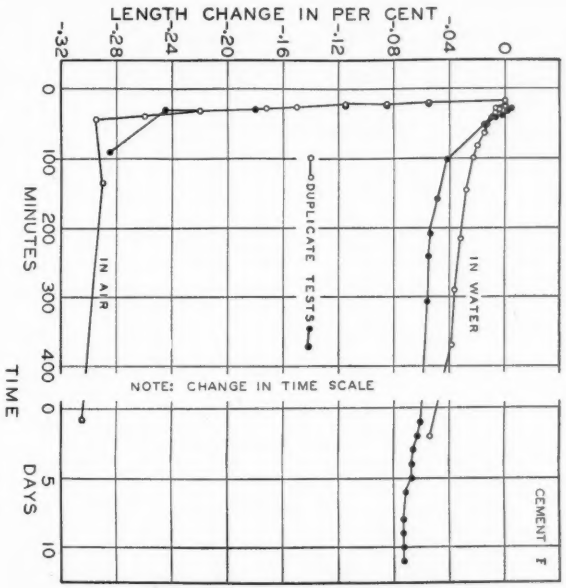

Fig. 5.—Dimensional change of cement on setting.

with a window, protected by a large flap, through which the specimens and needle were introduced. Thermometers were inserted in the jar for temperature determinations. The relative humidity was not determined, but was near complete saturation as water condensed on the inside of the jar. The specimens were introduced into the jar two minutes after the commencement of the mix. A schematic drawing of the set-up is depicted in Figure 3.

TABLE 5.—SETTING TIME OF CEMENTS

Cement*	Setting Time in Minutes	
	70 F. 65 Per Cent Relative Humidity	99 F.† Saturated Relative Humidity
A	27	18
B	8	5
C	21	12
D	5	7
E	22	11
F	15	6
G	11	7
H	8	5
I	16	7
J	15	8
K	16	10
L	14	10
M	12	7
N	6	4
O	40	15
P	20	7
Q	28	7

* Only light colored powders were used.

† Specimens were placed in the desiccating jar at 99 F. and saturation, two minutes after the starting of the mix.

Effect of Humidity and Slab Temperature.—In one experiment (Table 6), two humidities were used; namely, saturation (100 per cent) and desiccation (0 per cent). The latter was obtained by the use of phosphoric anhydride (P_2O_5) in the lower compartment of the desiccator. Two slab temperatures were used; namely, 99 F. and 32 F. They were obtained by immersing the slabs in water and in chipped ice. Since the lower temperature was below the dew point, the slab sweated. This diluted the liquids to some extent, but in the tests on four popular brands, this seems to have no harmful effect. This experiment indicates that the degrees of humidity at which the cement sets have no appreciable effect on its setting time, nor does the slab temperature when the mass is transferred to an environment at mouth temperature. The slab temperature has a pronounced effect if the cement is allowed to set on the slab. Cement C (Table 7) proved to be an exception.

TABLE 6.—EFFECT OF HUMIDITY AND SLAB TEMPERATURE ON SETTING TIME OF CEMENTS

Relative Humidity Per Cent	Slab Temperature Degrees Fahrenheit	Setting Time in Minutes Cements*			
		C	F	I	K
100	99	17	7	8	6
0	99	16	7	8	8
100	32	11	8	8	7
0	32	10	6	8	8
65	70	12	6	7	10

* Only light colored powders were used. All specimens were placed in the desiccating jar at 99 F. two minutes after the starting of the mix.

TABLE 7.—EFFECT OF HUMIDITY AND TEMPERATURE ON SETTING TIME OF CEMENTS

Relative Humidity Per Cent	Temperature in Degrees Fahrenheit	Setting Time in Minutes Cements*			
		C	F	I	K
65	70	21	15	16	16
55	80	26	12	12	12
40	80	28	14	14	13

*Only light colored powders used. All specimens were allowed to set at the same temperature and humidity conditions under which they were mixed.

A cool slab produces a much smoother mix as setting is retarded during the mix, but as soon as the mix is transferred to the mouth, the setting is completed uniformly, even though the slab was at a low temperature when the mix was made. Directions of the manufacturers are almost in unanimous accord regarding the use of the cool slab, and rightly so.

The same four cements were mixed at the following temperatures and relative humidities: 70 F., 65 per cent, 80 F., 55 per cent, and 80 F., 40 per cent, and allowed to set under the same conditions. The results are shown in Table 7.

TABLE 8.—EFFECT OF POWDER: LIQUID RATIO ON SETTING TIME OF CEMENTS

Amount of Powder Grams	Amount of Liquid C.c.	Setting Time in Minutes Cements C	F	I	K	M
1	0.25	7	7	8	5	7
1	0.50	21	15	16	16	12
1	1.00	120*	26	29	120*	100*

*Cements were not completely set.

TABLE 9.—EFFECT OF MIXING TIME ON SETTING TIME OF CEMENT

Amount of Powder Grams	Amount of Liquid C.c.	Mixing Time Minutes	Setting Time in Minutes Cements (70 F. and 65% Relative Humidity) C	F	I	K	M
1	0.50	1.5	21	15	16	16	12
1	0.50	3.0	31	18	15	23	20

Effect of Varying Powder: Liquid Ratio.—Thick mixes set faster than thin ones. Some of the thinner ones would not set completely even after a two-hour interval. Table 8 gives data on this experiment.

Effect of Mixing Time.—Most of the setting times were lengthened by prolonged mixing. Two variations in mixing time were used under standard conditions; namely, one and one-half and three minutes. (Table 9.)

Effect of Dilution of the Liquids.—The liquids of five popular brands were diluted by the addition of 10 per cent (by volume) of distilled water. In every instance, the setting time was decreased and, in one instance, the acceleration was very pronounced. Results are shown in Table 10.

Such a high dilution is a very severe test, as normally this would require approximately a day's exposure in a humidity closely approximating complete saturation, as will be shown later in this paper.

TABLE 10.—EFFECT OF DILUTIONS OF LIQUIDS ON SETTING TIME OF CEMENT

Dilution Per Cent by Volume	Setting Time in Minutes Cement (70 F. and 65% Relative Humidity) C	F	I	K	M
0	21	15	16	16	12
10	8	12	11	10	9

Two liquids having a relatively wide variation in free phosphoric acid content, liquid F (38.2 per cent) and liquid K (54.7 per cent) were placed on slabs at 70 F. in an atmosphere of 65 per cent relative humidity. When these were used for mixes at intervals of ten minutes up to thirty minutes, only slight variations in the setting time were observed.

Effect of the Rate of Addition of Powder.—The faster the powder is added to the liquid, the quicker the set, as shown in Table 11.

Effect of Color.—In several of the cement powders, some of the colors, es-

pecially the yellows, are obtained by different calcination of the powders. Some makers claim that their colors are obtained by adding pigments to a light shade of the powder. Some of the literature accompanying the packages advocated the use of the darker shades wherever possible, because of their ease of mixing and additional strength.

For these tests, several colors of five cements, namely, C, F, I, K and M, were used. The setting times on cements K and M did vary on several different colors. The others did not. The results are shown in Table 12. Uniform behavior of the different colors is a decided advantage. No experiments were made on the stability of the colors under oral conditions.

TABLE 11.—EFFECT OF RATE OF ADDITION OF POWDER ON SETTING TIME

Powder		Mixing Time Minutes	Setting Time in Minutes Cements (70 F. and 65 Per Cent Relative Humidity)		
Portions	Rate of Addition		C	I	K
8 equal	15 second intervals	2.0	31	17	34
8 equal	10 second intervals	1.5	25	14	30
8 equal	5 second intervals	1.0	14	10	24
8 equal	3 second intervals	0.5	9	7	9

ULTIMATE COMPRESSIVE STRENGTH

The ultimate compressive strength was considered to be an important property as the zinc phosphate cements in oral use must resist compressive forces. A satisfactory cement should rapidly develop a relatively high strength under service conditions, namely, at a temperature of almost 99 F. in a bath of saliva.

Preparation of Test Specimens.—The specimens used in these tests are cylinders approximately 0.25 inch in diameter and 0.50 inch high. Unfortunately, nearly all of the available literature reports the use of cylindrical specimens 5 mm. both in diameter and in height. This is considered contrary to acceptable engineering practice, which requires that the length be approximately twice the diameter.

The specimens were first formed in split stainless steel molds as shown in Figure 4. These molds were later discarded because many specimens were broken in removal, and it was necessary to machine the specimens in a lathe in order to obtain parallel ends. This latter procedure presented little or no difficulty in many of the cements, while in others serious troubles were encountered. Some specimens would break in the chuck while others would not machine easily.

After experimentation with glass and other materials such as celluloid, gelatine and hard rubber, the last mentioned was selected. Hard rubber tubing was cut into sections 0.50 inch long. Their ends were then plane surfaced at right angles to the long axis of the mold. In order to get a round cylindrical mold, the tube was reamed out to the desired diameter. (Fig. 4.) The molds were coated with a thin solution of a hard wax in benzene to facilitate the removal of the specimen. They were set on glass plates and the cement placed in them with the spatula used for mixing. A glass plate was pressed down on the top of the mold

to give a comparatively flat surface to the top of the cylinder. On this top plate, the balance of the cement mix was deposited. When this had hardened, the mold was removed and transferred to a heavy flat glass plate, which was charged with carborundum powder (200 mesh) and water. (Fig. 4.) The ends of the specimens were then plane surfaced by drawing the molds back and forth; care being taken to rotate them about one-quarter of a turn every few strokes. The most brittle of the cements were easily plane surfaced in this manner to within 0.0005 inch. The specimen was then pushed out of the mold and placed in storage in an appropriate medium.

Treatment of Specimens.—Clinical experience has well established the fact that the zinc phosphate cements are relatively unstable filling materials because of their tendency to disintegrate slowly and therefore to weaken. Some cements were thought to have a much shorter life than others. The dentist therefore rightly classified them as a temporary filling material. We were desirous of observing whether laboratory data would sustain such clinical findings and to repeat the work of another investigator.[2] It was decided to conduct some long-time tests and to determine the crushing strength after the specimens were aged for several months in various mediums. Seven specimens of each cement were made up and stored for twenty-four hours in distilled water and crushed. (Table 12.) Twenty additional specimens of each cement were made up. Ten of each were immersed in approximately 25 c.c., respectively, of

TABLE 12.—EFFECT OF COLOR OF POWDER ON SETTING TIME* OF CEMENT

Cement Powder	Color	Setting Time Minutes	Cement Powder	Color	Setting Time Minutes
C	Cream white	12	K	Light	10
C	Yellow white	10	K	Gray	7
C	Light gray	10	K	Pearl gray	6
C	Pearl gray	10	K	Light yellow	9
C	Yellow	11	K	Golden yellow	20
C	Grayish brown	10	K	Golden brown	7
F	No. 1 Ceramic light	7	M	No. 1 Light	6
F	No. 2 Light yellow	6	M	No. 2 Light gray	7
F	No. 3 Light gray	6	M	No. 3 Pearl gray	6
F	No. 4 Pearl gray	7	M	No. 4 Light yellow	6
F	No. 5 Golden yellow	7	M	No. 5 Yellow	12
F	No. 6 Golden brown	6	M	No. 6 Golden brown	11
I	Snow white	7			
I	Light yellow	7			
I	Pearl gray	7			
I	Golden yellow	7			
I	Grayish brown	7			
I	Golden brown	6			

*Specimens were placed in the desiccating jar at 99 F. and saturation.

2. Footnote 1, second reference.

liquid petrolatum (U.S.P.) and distilled water. The ones in distilled water were placed in a constant temperature oven at 99 F. The control specimens in the oil were stored at room temperature. Some specimens of several other cements were immersed in a synthetic saliva, the formula of which is given in a previous publication.[3] This saliva was not inoculated with mouth organisms. It was divided into three portions which were brought to p_H 4, p_H 6.6 and p_H 8, respectively. About six months later, the specimens were crushed. There was practically no difference in the crushing strength of specimens immersed in the synthetic saliva and in distilled water.

Method of Obtaining Data.—The specimens were crushed in a small testing machine of the beam type which was adjusted to its 2,000 pound capacity. The speed of the motor was adjusted, to move the head of the testing machine one-one-hundredth inch a minute, while crushing the specimens. At this speed, from one and one-half to three minutes was required to break the specimen. Data are given in Table 13. These values represent the average compressive strength as determined by averaging results from a set of five successive specimens. If the value for any individual specimen varied more than 15 per cent from the average, it was discarded and the average of the remaining specimens was reported. In case more than two of the specimens were eliminated, the test was repeated. This is in accordance with standard procedure in testing calcined gypsum.[4] The values were then rounded off to the nearest 500 pounds per square inch.

The strength of some of the cements decreased alarmingly in distilled water over a period of six months. The re-

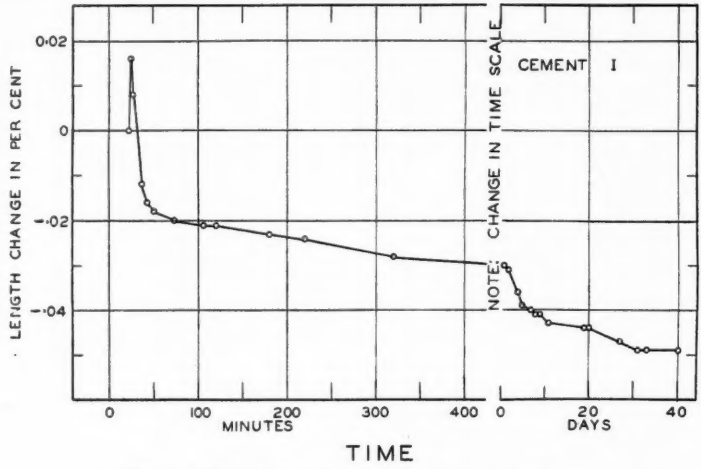

Fig. 6.—Dimensional change of cement on setting.

3. Souder, Wilmer, and Sweeney, W. T.: Is Mercury Poisonous in Dental Amalgam Restorations? D. Cosmos, 73:1150 (Dec.) 1931.

4. Federal Specification for Calcined Gypsum No. SS-G-901.

trogession in one case, Cement C, amounted to 50 per cent. There was a large amount of disintegrated cement in some of the bottles containing distilled water. The cements behaving in this manner were always weak and chalky. Specimens of A, B and C often had crystals growing from their surfaces. In Cement B, this also occurred in the liquid petrolatum. This type of disintegration can easily be determined by the dentist in his office. All that is necessary is to mix the different brands under the same condition, drop the pellets in different bottles of distilled water and, after several days, note the disintegration. In some cements, this may occur in less than twenty-four hours.

TABLE 13.—COMPRESSIVE STRENGTH OF ZINC PHOSPHATE CEMENTS

Cement	Compressive Strength in Pounds per Square Inch		
	Distilled Water		Liquid Petrolatum (U. S. P.)
	24 hours	6 months	6 months
A	3,500	5,000	6,500
B	4,500	3,500	3,500
C	6,500	3,500	7,000
D	5,500	8,000	13,500
E	12,000	8,000	14,000
F	9,000	11,500	13,000
G	11,000	14,000	13,500
H	13,000	12,000	14,000
I	12,000	11,500	14,000
J	11,500	13,000	14,500
K	10,500	11,500	11,000
L	11,500	8,000	9,500
M	11,000	9,500	12,500
N	9,000	6,000	7,000
O	7,500	6,000	7,000
P	8,500	12,000	14,000
Q	16,500	19,000	16,000

Effect of Powder: Liquid Ratio.—Most of the mixing directions stressed the importance of using as much powder as consistent with the plasticity desired in the mix. This would vary according to whether the mix was to be used for cementing an appliance or as a filling. Several mixes of varying proportions were made on cements F and I. It was found that the extremely heavy mixes of putty-like consistency were not appreciably stronger than some of the more plastic mixes, as shown in Table 14.

TABLE 14.—EFFECT OF POWDER: LIQUID RATIO ON COMPRESSIVE STRENGTH OF CEMENTS

Powder Grams	Liquid C.c.	Compressive Strength in Pounds per Square Inch	
		Cement F*	Cement I†
0.50	0.50	5,500	
0.75	0.50	8,000	
1.00	0.50	9,000	12,000
1.25	0.50	13,000	13,500
1.50	0.50	14,500	18,000
1.75	0.50	14,000	17,500
2.00	0.50	15,000	19,000
2.50	0.50	16,000	19,500
3.00	0.50	16,500	19,000

*Specimens immersed in distilled water for twenty-four hours.

†Specimens immersed in distilled water for two weeks.

TABLE 15.—COMPRESSIVE STRENGTH* WITH TIME

Cement†	Time				
	1 Hour	3 Hours	1 Day	1 Week	4 Weeks
F‡	10,000	11,500	13,000	16,000	17,500
F#	11,000	13,000	14,500	15,500	15,000
K‡	10,000	10,000	16,500	17,000	16,500
K#	10,500	10,000	15,500	16,000	16,500

*Pounds per square inch.

†Mixes made with 1.50 gm. of powder to 0.50 c.c. of liquid.

‡Specimens were immersed in liquid petrolatum.

Specimens were immersed in distilled water.

Crushing Strength with Time.—How long a time is required for a cement of

this type to attain its maximum strength? Tests on Cements F and K indicated (Table 15) that it was attained in virtually one day and that even after one hour at least two thirds of the maximum was reached.

Crushing Strength with Color.—Many dentists and Government departments have often used the dark colored cements on the theory that they are stronger. This idea has almost become established because of the advice of some makers that the dark colored cements are to be used whenever possible. Various colors, light and dark, of three cements, C, I and K, were tested to determine whether this were true. The crushing strength of cement C, whose makers advise the use of the dark cements, did seem to fluctuate enormously with the various colors, but some of the light colors were as strong or even stronger than the dark ones. (Table 16.) The crushing strength of cements I and K did not show any significant variations for different colors.

Change in Dimension on Setting.—Most of the previous work on change in length or volume of zinc-phosphate cement during the setting process has been only qualitative. Such methods as filling a glass tube and placing it in dye or ink and noting the change in dimension by the movement of the colored liquid up the side of the tube have been used. These gave a rough indication of the relative shrinkage of different cements, but are not satisfactory for determining the quantitative value for this property.

The dental interferometer, which has been successfully used to measure setting changes on amalgam, was found to be satisfactory for cement.[5]

The specimens of cement were mixed in the standard way as described elsewhere in this paper (1 gm. powder to 0.5 c.c. liquid and one and one half minutes' spatulation), unless otherwise noted. They were formed by placing a thin celluloid tube over a small brass rod having a countersunk end (Fig. 2, *E*), and a small glass plate was pressed down on the top of the specimen. This gave a specimen 10 mm. (0.3937 inch) long and 6 mm. (0.236 inch) in diameter, with one end rounded and the other flat. This type of specimen was considered satisfactory for use in the interferometer. As soon as the specimen had hardened sufficiently to hold its shape, the celluloid form was removed

TABLE 16.—COMPRESSIVE STRENGTH WITH COLOR

Cement*	Color	Compressive Strength Pounds per Square Inch
C	Cream white	6,500
C	Yellow white	3,000
C	Yellow	4,000
C	Light gray	7,000
C	Pearl gray	4,500
C	Grayish brown	3,500
C	No. 1 white†	10,000
C	No. 6 dark brown†	8,500
I	Snow white	13,000
I	Light yellow	12,000
I	Golden yellow	12,000
I	Pearl gray	13,000
I	Grayish brown	13,000
I	Golden brown	10,500
K	Light	10,500
K	Light yellow	11,000
K	Light gray	10,000
K	Pearl gray	10,500
K	Golden yellow	9,500
K	Golden brown	9,500

*Specimens immersed in distilled water for twenty-four hours.

†Special inlay cement of the same brand.

5. Footnote 1, third reference.

and the specimen adjusted to approximately the correct length between the jaws of a micrometer. It was then placed in the interferometer, which had previously been immersed in distilled water. The level of the water was between the top and bottom surfaces of the top plate of the interferometer.

The specimen was immersed in water as quickly as possible after the celluloid form was removed, in order to avoid any drying out on the surfaces. The first observation on the length was taken as soon as the interferometer could be adjusted to give a satisfactory number of fringes. The changes in length were then observed at convenient intervals of time by noting the change in the number of fringes between two reference points (a circle) on the top plate of the interferometer. From the calibration of the interferometer for these conditions, the change in length per centimeter was determined.

Figures 5 and 6 show curves on two typical cements mixed as described above. Figure 5 shows the length change of a cement under water and in air at room temperature over periods of time up to eleven days. Duplicate runs are plotted to indicate the variation to be expected on the same material. As was expected, the samples tested in air show a great shrinkage as compared to those immersed in water. This indicates that drying out of a cement is very detrimental. As most, if not all, of the cements in practice are not allowed to dry after they are set up, the shrinkage under moist conditions is of major importance to the dentist. Therefore, the shrinkage was measured in the wet condition. These observations on Cement F show that most of the shrinkage occurs in the first few

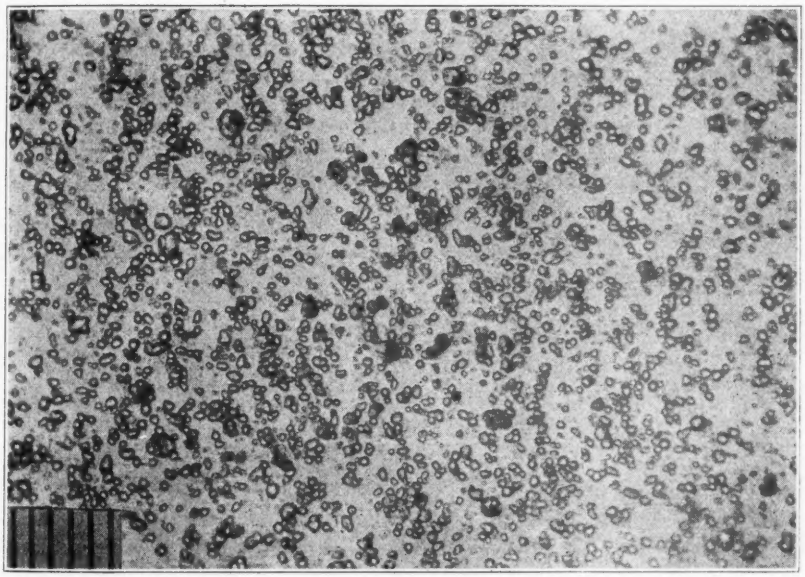

Fig. 7.—Particle size of cement powder I. Each scale division equals 10 microns.

hours, after which it approaches a stable condition, with only a slight change for several days.

Figure 6 shows the observations on a standard mix of Cement I, immersed in water for forty days. This specimen expanded when first placed in the interferometer (probably owing to water absorption) and then contracted rather rapidly for the first hour (the time is measured from the start of the mixing of liquid and powder). A stable condition was reached after several days. We wish to point out that the total change here is small, about 0.05 per cent (5 microns per centimeter), and a length change of 0.01 or 0.02 per cent is considered very little for this type of material, which is slightly soluble in water.

Several similar tests were made on other brands of cement, all of which showed a shrinkage after a few hours: in some cases, as much as 0.20 per cent, and several from 0.08 to 0.14 per cent.

Since the length change on setting will depend to some extent on the proportion of powder to liquid in the mix, method of mixing, etc., these tests are not included in this report as we expect to take up this phase in greater detail later. But it is believed that cements showing an excessive shrinkage are undesirable for the same reason that a shrinking amalgam has been condemned; also that a cement that has been so balanced in manufacture that it reaches an equilibrium which gives it constant volume for a given temperature is less likely to cause trouble for dentist and patient.

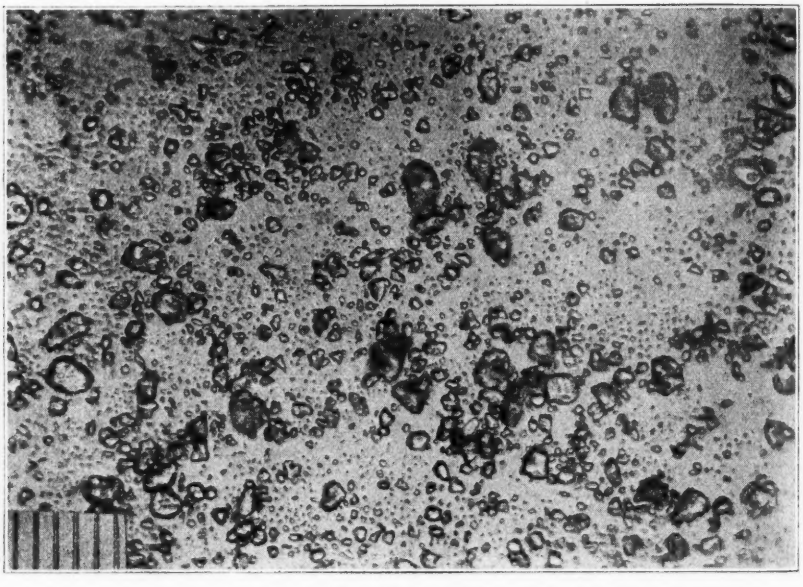

Fig. 8.—Particle size of cement powder K.

The linear change in dimension with temperature has been reported[5] for the silicate cements, but not for the zinc phosphate cements.

Particle Size of Powder.—A cursory

(microscopic) examination revealed that some of the powders were uniformly fine (Fig. 7), while others were mixtures of fine and coarse particles (Fig. 8).

One gram samples of several cements were water floated and the residue examined for coarse particles. Later, these were sampled and measurements of the larger particles were obtained with a micrometer microscope. Some of these were almost 0.1 mm. in diameter. (Fig. 9.) As has been pointed out by other investigators,[6] fine powders facilitate the correct seating of satisfactory inlays.

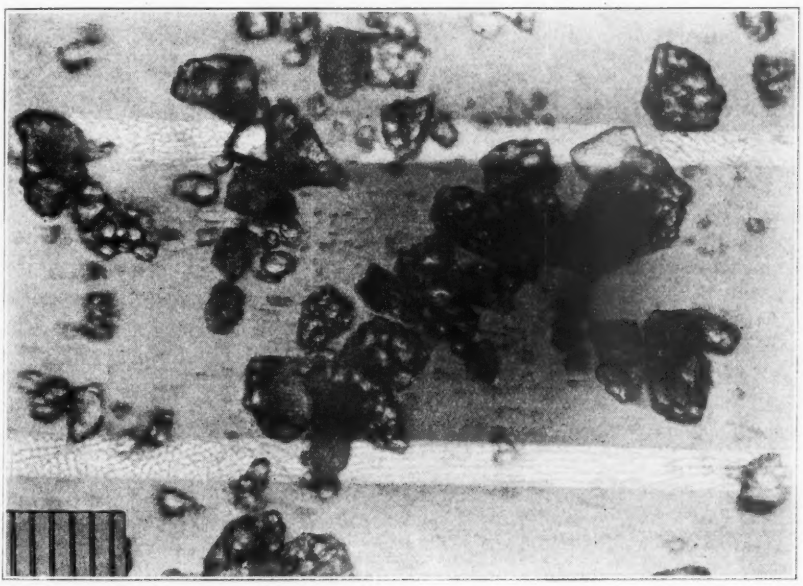

Fig. 9.—Large particles of cement powder P, separated by water floating. Each scale division equals 10 microns.

Gas Formation.—All of the cements were examined to determine whether any gas was released when the powder and liquid were brought into contact. A small portion of powder and a small drop of liquid were examined under a microscope after mixing between a glass slide and a thin cover glass. With this method, only one cement, C, gave off gas bubbles. (Fig. 10.) No attempt was made to ascertain what the gas was chemically.

Change in Weight of Cement Liquids After Exposure to Air.—All cement liquids are hygroscopic and will readily absorb or give off water according to atmospheric conditions above the liquid. Careless handling of the cement liquids often alters them to such an extent that the setting time and other properties are changed. This change may readily be produced by having the stopper out of the bottle more than is necessary.

Approximately 2 gm. of the liquids F and K were placed in a flat bottom beaker

6. Gillett, H. W., and Irving, A. J.: Gold Inlays by Indirect System, New York City: Dental Items of Interest Publishing Co., 1932.

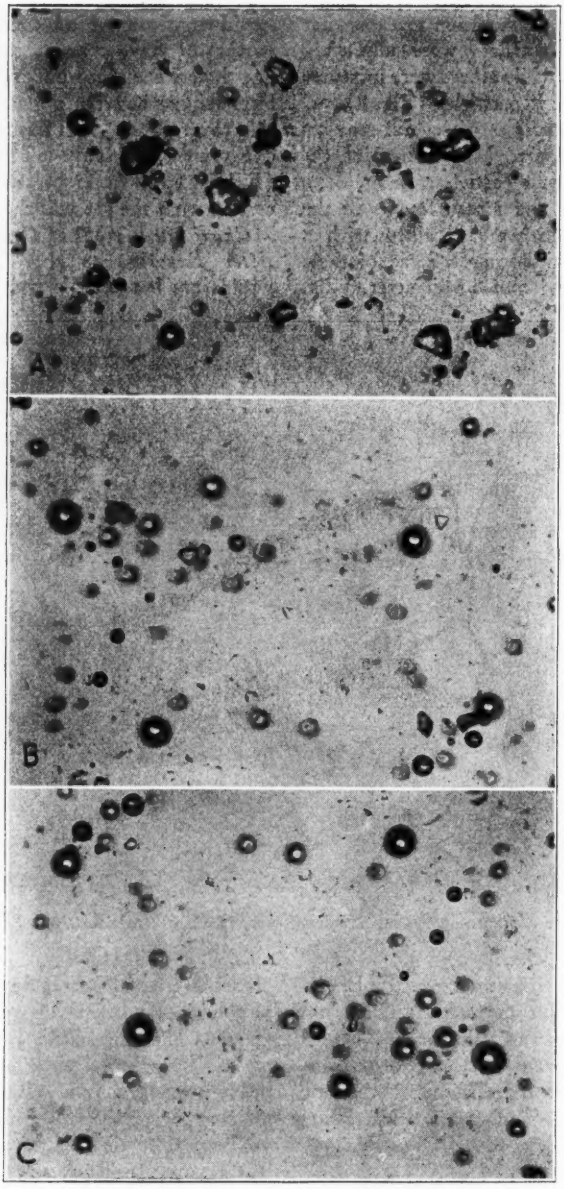

Fig. 10—Gas evolved when powder and liquid of cement C are mixed. *A*, initial picture; *B*, same as *A*, but fifteen minutes later; *C*, same as *A*, but twenty minutes later. The circular areas are gas bubbles.

and weighed at various intervals up to one month. The beaker was protected from dust contamination. The experiment was repeated, the specimens being placed in a desiccating jar the bottom compartment of which was filled with water. The results are presented in Table 17.

SUMMARY

1. Sixteen zinc phosphate cements and one cement of the silicate type recommended for the same purposes were investigated.

TABLE 17.—WEIGHT CHANGES IN CEMENT LIQUIDS AFTER EXPOSURE TO AIR

Time	Change in Weight (Per Cent)	
	Liquid in Air*	
	Liquid F.	Liquid K.
15 minutes	−0.3	−0.05
1 hour	−0.7	−0.1
1 day	−7.5	−0.8
1 week	−17.7	−6.0
1 month	−24.6	−15.7
	Liquid Over Water	
3.5 hours	+1.2	+2.0
5 hours	+2.0	+3.4
1 day	+6.9	+11.5
1 week	+23.7	+38.7
1 month	+76.0	+109.0
3.5 months	+166.0	+229.0

*Temperature varied between 70 and 80 F., relative humidity, between 25 and 50 per cent.

2. The amount of powder and liquid used, the temperatures of the slab, the time of mix and rate of powder incorporation were found to influence the physical properties of these cements. Therefore, a standardized technic for mixing these cements was evolved. This is very simple and can be used in routine office practice.

3. The cement powders and liquids were analyzed. The major constituent of all of the powders, with the exception of one, was zinc oxide. Sometimes, modifiers such as bismuth oxide up to 4.5 per cent and magnesium oxide up to 13.0 per cent were added. The cements using a powder composed almost wholly of zinc oxide seemed to have some inferior qualities such as low crushing strength or disintegration in distilled water.

The liquids consisted of phosphoric acid solutions buffered with various quantities of zinc oxide and aluminum hydroxide.

4. Through a method of determining the setting time and the effect of various conditions on it, it was found that humidity did not appreciably affect setting time, and that slab temperatures did not unless the cement was allowed to set on the slab. The use of a cool slab was found to have many advantages, especially in the production of a smooth mix. The heavier the mix, the faster the set. Prolonged mixing time increased the time of set. A 10 per cent dilution of the liquid with distilled water also decreased it. It was decreased with a rapid addition of the powder. Some of the cements showed wide variations in setting time for different colors while other cements had uniform setting times for all colors.

5. Suitable test specimens were prepared for the determination of crushing strength. Values ranged from 3,500 to 16,000 pounds per square inch for specimens immersed in liquid petrolatum for six months. The strength of many was decreased, some as much as 50 per cent, when they were stored in distilled water for the same length of time. The strength of a cement of the silicious type increased 3,000 pounds per square inch. The thicker mixes were stronger than the thin ones, but heavy mixes of putty-like consistency were no stronger than

more plastic mixes. Some of the cements reached almost two-thirds maximum strength in one hour and, at the end of twenty-four hours, were practically at full strength. Some cements of different colors were not uniform in compressive strength, but the dark colored cements were not necessarily stronger than the lighter colored ones.

6. All the cements tested shrank appreciably on setting.

7. Some of the powders were of relative uniform particle size, while others were mixtures of all sizes, up to those approximately 0.1 mm. in diameter.

8. One cement gave off a gas when the powder and liquid were brought in contact.

9. Exposing the cement liquid to the atmosphere of the laboratory (70-80 F. and 25-50 per cent relative humidity) caused a loss in the water content. Exposing it over water at the same temperatures caused an enormous increase in the water content.

10. The dentist can determine for himself the ability of a cement to withstand disintegration in water. Standard mixes can be made of the desired cements and the pellets placed in water or in his own or artificial saliva. It is recommended that the dentist make this test in his own laboratory at his earliest convenience.

11. With additional data on other properties, a specification can be written for this type of material.

12. Manufacturers' directions for mixing their cements are neither adequate nor accurate. The directions should specify the powder:liquid ratio, the rate of addition of the powder to the liquid, the time of spatulation and the temperature of the slab, giving such other instructions as are necessary to make the mixing of the cement a definite procedure.

PITFALLS ENCOUNTERED IN THE TREATMENT OF MALOCCLUSION*

By ABRAM HOFFMAN, D.D.S., F.A.C.D. Chicago, Ill.

IT is the purpose of this paper to bring to the attention of those who are interested in the correction of irregularities of the teeth some of the conditions associated therewith that may be classed as obscure, unsuspected or unexpected. There will be no attempt to mention these conditions in the sequence of their seriousness, but rather an attempt to present the material in a manner that will prompt a "look before you leap" attitude, before treatment is undertaken.

The dentist is attracted to this beneficent art because of the many results possible through skilled orthodontic treatment; because of the enthusiastic and favorable comment on the part of the pleased patients or parents, and because of the reputed lucrative returns. He

*Illustrated during the reading by lantern slides.

*Read before the Missouri State Dental Society, St. Louis, May 16, 1933.

becomes the beneficiary rather than the benefactor. Thus do we encounter our first pitfall.

Angle has said:

> Orthodontia, when mastered and practiced as a specialty, becomes one of the most fascinating of the professions and gratifying in its practice, having as it does a clientele far more nearly ideal than is to be found in any other branch of medicine, composed of patients in health and in the flower of youth —and that, too, of the cultured and affluent.[1]

This enticing paragraph, if carelessly read, might easily constitute a pitfall, but if we emphasize the words "when mastered," the complexion of the statement is completely changed. And, as we read farther, he says:

> Yet its exactions on the student and practitioner are so great that only those highly qualified in the science can ever hope to truly succeed; but for such there awaits a field almost limitless in extent and in which they will receive prompt recognition.[1]

The point that I wish to make at this time is this: There is far too much pseudo-orthodontia being practiced and there are too many dentists undertaking this class of work with little or no orthodontic background. Those of you who know me best know that for years my attitude toward the members of our profession has been one of helpful and sympathetic interest in the family dentist's problems in the treatment of malocclusion.

The family dentist's greatest pitfall at the outset is his insufficient appreciation of causative conditions behind the obvious condition which he thinks himself able to treat.

I like to think of the science and practice of orthodontia as dealing with the functional nature of the dental apparatus; having for its objects the prevention and correction of malocclusion of the teeth and the harmonizing of the structures involved, so that the dental mechanism thus produced will be best suited to the functional activities of the human organism as a whole. In theory or in practice, it is a study of growth and development linked with physical and mechanical principles—a biomechanical science. We find, on analysis, that the foregoing concerns much more than the mere correction of irregularities of the teeth. Orthodontists have been so thoroughgoing in selling their wares that it behooves the man who wishes to practice orthodontia in any degree to qualify in accord with the foregoing requirements.

If we pause for a moment to analyze the definition, we find "prevention and correction." In order to prevent irregularities, we must have a knowledge of biology, which, of course, implies the origin and development of the denture from the formation of the first tooth germs at about the sixteenth week of fetal life to young adult life, or about the twentieth year. A comprehensive knowledge of these changes is in itself an extensive study. Without such knowledge, one can hardly be expected to anticipate the irregularities which may arise at any time within this span.

There are a great many factors which may enter in: prenatal conditions and nourishment, postnatal foods, childhood diseases, habits in a great variety (such as the use of pacifiers, thumb-sucking, abnormal breathing and undesirable sleeping postures), the presence of dental caries or abscesses, premature loss of teeth, restorations that are not in keeping with the demands of health, and a great many more. So much, briefly, for the biologic side.

As we approach the thought of correction, our first object should be to restore function to the highest possible

1. Angle, E. H.: Malocclusion of Teeth, Ed. 7, Philadelphia: S. S. White Dental Mfg. Co., 1906, p. 5.

degree. This means not only the restoration of the function of mastication, but it also implies the arranging of the teeth so as to harmonize with the human organism as a whole. Much might be said as to the function of mastication, but to such an audience as this, its importance is at once obvious. The orthodontist has the further aim of improving facial balance, and, through it, promoting beauty, charm and personality. We must not lose sight of the fact that skilful orthodontic treatment can also correct certain defects of speech, as well as enhance voice resonance—the secret of a pleasing or musical voice.

In the definition of orthodontia, I mention the mechanical aspect. Many present authorities are apt to treat the mechanical side lightly. Such an attitude would be more acceptable if we had reached the point where prevention superseded correction, but until such time as man or nature succeeds in preventing the development or occurrence of irregularities, we shall need mechanical principles and devices in our work. Let us not forget that orthodontia is a biomechanical science.

EXTRACTION OF DECIDUOUS TEETH

The problem as to whether to extract deciduous teeth before they are ready to be shed in the natural manner is one that has been under discussion for many years, and it is questionable whether any set of rules governing this condition can be formulated. We will include a few selected opinions on the subject.

Pierre Fauchard, a French dentist, in his book "Le Chirurgien Dentiste," published in 1728, exploited thus early a caution with regard to the extraction of the deciduous teeth and its influence on the developing dentures. He begins by saying:

> The milk teeth, although destined to be shed, should never be extracted except in cases of absolute necessity. . . . The alveoli of the infantile jaw are weak, whilst the roots of the deciduous teeth are sometimes firmer and more solid than one would believe, and hence it is that, in extracting a milk tooth, one runs the risk of injuring the alveolus and even of carrying away a portion of it together with the tooth, not to speak of the danger of damaging or even destroying the germ of the permanent tooth lying below. Besides, there are sometimes deciduous teeth that are never shed and never renewed. One must, therefore, defer drawing children's teeth as long as possible unless the teeth are loose. When intolerance of pain or a caries endangers the integrity of the neighboring tooth and obliges one to rescue without delay to extraction, one should carry out the operation with prudence and judgment, so as to avoid the dangers alluded to. . . .
>
> It sometimes happens, that one finds in children a crooked tooth by the side of a straight one; in these cases ignorant tooth drawers often have been known to remove the crooked (permanent) tooth, and to leave the straight one or deciduous one, which afterwards falls of itself, the individual thus remaining deprived of one of his teeth for the rest of his life. The rule to be observed in order to avoid a similar error is always to extract the older of the two teeth and to leave the one that has been cut more recently, which is easily recognized by its being ordinarily firmer in the socket and of a better color than the first.[2]

That passage was written over 200 years ago, long before anything like modern dentistry was thought of, when dental ills were cared for principally by barbers, itinerant healers, charlatans and the like. It was sound logic then and it is sound logic now, and it, with many like passages in his writings, fully justifies the sobriquet which has been bestowed on him: "The Father of Dentistry."

The extraction of deciduous teeth in pairs (upper and lower on the same side of the denture) to hasten eruption, or

2. Weinberger, B. W.: Orthodontics: Historical Review of Its Origin and Evolution, Vol. II, St. Louis: C. V. Mosby Co., 1926, p. 146.

to aid in the alinement of permanent successors, is debatable. There is no question that, at the proper time, the extraction of a deciduous molar does aid the eruption of its succeeding bicuspid, and there is a strong argument for this, especially if the early appearance of the successor is evident. Whether to remove its antagonizing mate at this time is a subject for discussion.

Charles R. Baker, of Evanston, Ill., is a firm believer in the principle of removing deciduous teeth in pairs, and he upholds his principle in very interesting papers which should be read and studied carefully by all interested in the development of occlusion.

Dr. Baker's ideas may be summarized in his own words:

> An upper deciduous molar must be lost from the arch at approximately the same time that the corresponding lower deciduous molar is lost, or the result will be malocclusion. Normal occlusion cannot be produced if there are deciduous molars in one jaw and bicuspids in the opposing jaw (on the same side of the mouth) for the teeth will not be of the proper mesiodistal width to harmonize. Under these circumstances, if there is proximal contact in both arches, there will be malocclusion either anterior or posterior to the deciduous molar region.
>
> To have the final occlusion normal, it is necessary to have the arches harmonize in the deciduous molar region, as to number and kind of teeth throughout the entire development of the arches; they must develop symmetrically.
>
> The idea that all deciduous molars should be kept in the arches as long as possible is wrong. There is a definite time when each deciduous molar should be lost. It is important to keep the lower deciduous molars in the arch until the lower bicuspids are ready to erupt, but as soon as the lower first bicuspid erupts, the upper deciduous first molar should be removed from the arch. As soon as the lower second bicuspid erupts, the upper deciduous second molar should be removed. This will permit harmony in the size of the jaws as they develop. The upper deciduous molars should be removed at the proper time regardless of the physical condition of the teeth themselves, or the age of the patient. It is a matter of the relation of the individual tooth to the development of the jaws.[3]

I hold Dr. Baker's opinions in high esteem, but I regard deciduous teeth as being of great importance, and I rebel at the thought of extracting them before the psychologic time, for their loss is serious. They are too frequently regarded as only "temporary" in character. It should be remembered that these teeth supply the wants of the child during a tender age, when mastication depends on instinct rather than on intelligence, and at a time when the delicate digestive apparatus is prone to injury because of the result of imperfect mastication. They are, therefore, valuable.

Extraction of deciduous teeth would be a short story and easily told if the jaws were always in the proper proportion and the development and eruption of the second teeth were always normal. The loss of these teeth too long in advance of their time usually results in a settling of the arch or in the forward drift of teeth that are posterior to the remaining space. Thus, we lose a "growth factor," a force of approximal contact without which there will be an apparent lack of development. If there is a pathologic condition at the apex and the health of the child demands the early removal of a deciduous tooth, the resulting space should be preserved through the medium of a space-maintaining device. An erupting tooth will usually act as its own space maintainer, provided the extraction is not more than six or eight months in advance of the time of the normal eruption.

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3. Baker, C. R.: Deciduous Molars and Their Relation to Development of Jaws; Internat. J. Orthodontia, 3: 253 (May) 1917.

THE TRANSITIONAL PERIOD

The transition from the deciduous denture to the permanent denture affords opportunity for interesting study. This period, perhaps the most important of all in the development of the denture, probably receives less thoughtful consideration than any other phase in the development of occlusion—certainly less than its importance indicates. We could properly devote much more time to its consideration than the present opportunity allows. Therefore, I shall confine myself to a discussion of the physiologic exchange of these teeth or, may we say, the psychologic time for effecting the change. We find, in a study of the factors in malocclusion, prominently listed, premature loss and prolonged retention of the deciduous teeth.

It is rather a paradox that two diametrically opposed conditions should be able to work so much havoc—alike, yet unlike in results. Obviously, such a statement needs some explanation. It may be well to say here that, by premature loss, I mean loss through either natural or unnatural conditions occurring so early as to be a factor in the development of malocclusion. By prolonged retention, mean the retention of a deciduous tooth for such an abnormal length of time as to be a factor in the development of malocclusion.

Broadly speaking, the former results in a settling, or collapse, of the arch, leaving too little room for the succedaneous teeth; whereas, the latter results in a deflection of the succeeding teeth, or, as will be explained later in the case of the second deciduous molars, the retaining of more space than will be required by the succeeding bicuspids.

I am in full accord with the theory that the normally developing child denture at about 5½ years of age should have definitely marked developmental spaces between the anterior teeth. This condition is considered as indicative of a normal lateral growth of the alveolor arches and their supporting bases, compensating for the increased width of the larger permanent incisors within the alveolar bone. I realize that some present day writers are not in accord with this theory, but until such time as we have sufficient scientific data to dispute the value of these developmental spaces as a diagnostic aid, I shall continue to advocate the application of this theory.

We shall do well to watch the development of the lower deciduous arch very carefully. Because of the usual eruption of the lower teeth in advance of the upper, the mandibular arch becomes the pattern over which the maxillary arch is formed. In addition to the advanced eruption of the lower teeth, the mandible is endowed with mobility, and, accordingly, we have a dynamic force exerted against the maxillary teeth which helps to stimulate the lateral development of the upper arch and accentuate its developmental spaces.

The teeth erupt at the crest of the alveolar ridges in accord with Nature's plan, forming an arc of a circle, or, as it is often described, a semi-ellipse, which, for the purpose of convenience, we will call the line of occlusion. Briefly, the line of occlusion is described as the line of greatest occlusal contact. The orthodontist would define this line more elaborately, but the foregoing is sufficient for our present purpose. It may be said at this point that the equality of muscular pressure (the tongue from within and the lips and cheeks from without) assists in guiding the erupting tooth to its proper position in relation to the line of occlusion.

From the foregoing, it becomes obvi-

ous that any force or condition that affects the shape, form or size of the mandibular arch will have a reactionary effect on the maxillary arch.

Let us now think of the premature loss of a deciduous tooth by extraction in terms of a collapse of the lower arch, or a break in the continuity of it. A condition develops which I have frequently described as "robbing Peter to pay Paul."

The permanent lower central incisor is, according to the average established by G. V. Black, twenty-two hundredths inch in width, which is seven hundredths inch, on the average, wider than its deciduous predecessor. Thus, we at once discover the necessity for the developmental spacing or lateral development referred to. This permanent incisor tends to erupt to the lingual aspect of its deciduous mate, and as the deciduous tooth is shed, the tongue pressure should move the erupting tooth to its proper position in the line of occlusion. If this is normally accomplished, all well and good. If there has been a collapse, which is to say a lack of lateral development, in the arch, there will be insufficient room. At this point, someone will probably extract the adjacent deciduous lateral incisor to make room for the central. Our pitfall has been laid. Then and there, steps should have been taken to expand and stimulate the lateral development of this deciduous arch, because, plainly, the oncoming lateral incisor has been robbed of its quota of space and will erupt out of alinement.

At this point, perhaps, the most serious mistake is apt to be made; namely, the extraction of the deciduous cuspid. The lateral incisor may be benefited from such extraction, but the seriousness of the mistake does not become apparent for about four years, during which period the molar segment will drift mesially. When the cuspid erupts, therefore, it will be in malalinement, probably in torsolabioversion. There are other factors in the accentuation of this condition. The forward mesial eruptive force of the permanent molars, coupled with the retractive force of the lower lip, is usually so pronounced as to result frequently in the contact of the lateral incisor and the deciduous molar, or the first bicuspid, if it has displaced the molar by this time.

The clinical picture is the familiar prominent cuspid or "buck tooth." The premature loss of the deciduous cuspids, plus the muscular pressure of the lips, is responsible for many of the deep overbites in the permanent incisor region.

THE OPPORTUNITY OF THE FAMILY DENTIST

We hear and read a great deal about the so-called "simple case" which the general practitioner should be able to treat. The question naturally arises, and it is not an easy one to answer: "What is a simple case?" It seems to me that the question is not one as to "*what types*" the dentist should treat, but very definitely "What types is it possible for him to diagnose?" After all, treatment is based on diagnosis, and, without proper diagnosis, the treatment is very likely to be faulty. No matter how earnest and diligent the effort may be, if the premise is wrong, the result remains a question.

I am betraying no secret in saying that treatment is too frequently undertaken on the most casual examination only, with little or no thought given to the underlying etiology. Empiric experience plays too great a part in these conclusions. Treatment is undertaken purely on a mechanical basis and without thought of a widening of scope or change in plan. This, in itself, is sufficient to

preclude successful termination. The physican might as well set out to cure appendicitis with a simple program of castor oil, or the automobile mechanic might as profitably try to correct engine trouble by replacing a tire. Lack of correct diagnosis has kept our "talk experts" busy in an unprecedented way during the last four years. There is too much of prognosis and too little of etiology.

But to return to the question of "simple cases": If the dentist is able to diagnose a case and then place it in a group or under some sort of classification, the plan for treatment will be much simplified. I find it much easier to outline to the average general practitioner the type of case he should not attempt rather than to enumerate the ones he might undertake. The following conditions should be classed as definitely out of his range:

1. Malocclusion complicated by the loss (by extraction) of permanent teeth, i. e., cases of mutilation.
2. Perversion, uneruption or impaction of cuspids.
3. Malalinement of arches, requiring considerable arch development.
4. Overbite due to inharmony in size of teeth or inharmony in the amount of tooth material contained in the arches.
5. In young adults (10 years of age or over) cases complicated by the congenital absence of teeth.
6. Complication from the presence of tooth crowns of anomalous development as to size and form.
7. Openbite.
8. Deep overbite.
9. Torsoversion of molars.
10. Cases involving extensive root movement.
11. Crossbites in the permanent molar and bicuspid regions.
12. Premature loss of deciduous teeth making necessary the bodily movement of bicuspids and molars.
13. Cleft palate.
14. Distocclusion (nearly all cases) (Class II).
15. Mesiocclusion (nearly all cases) (Class III).

The following types embrace conditions which the family dentist may undertake to treat, especially if he has been or is interested in the theory and clinical aspects of orthodontia:

1. The case in which deciduous arches need stimulation to laterial development (developmental spaces previously referred to), which will help to prevent malposition of the permanent incisors.
2. The case of the newly erupted upper or lateral incisors locked in lingual relation to lower.
3. Crossbites in the deciduous molar region.
4. Neutroclusion cases (Class I) in the early mixed dentures requiring slight expansion but not involving an abnormal occlusal plane.
5. Slight labial protrusion of upper incisors with ample space in the arch and occlusal plane normal.
6. Occasional distocclusion cases (Class II) involving change of the arch relationship only.
7. Occasional mesiocclusion (Class III) cases involving change of arch relationship only.
8. Malposition of a single tooth, provided there is ample space in the arch.
9. Interception of malocclusion by the extraction of a deciduous tooth when the conditions are verified by roentgen-ray diagnosis.
10. Interception of malocclusion by the placement of space maintaining devices, necessitated through the premature loss of a deciduous tooth.

Naturally, it is assumed that the dentist will be able to diagnose these simpler conditions. As always, the personal equa-

tion enters in and must tip the scales for or against the undertaking.

CASES PRESENTING PITFALLS

It is surprising to note the number of dentists who will approach an orthodontist with a request for aid. The only diagnostic evidence which he has to offer is an incomplete word-picture, which may or may not be supplemented by a pair of inexpertly executed models. At once, everyone is at a disadvantage, for it is impossible to formulate a conclusive diagnosis or to give an outline of treatment without a visual examination of the patient, supported by every bit of obtainable case history. With the best information available, the orthodontist frequently finds it necessary to resort to one of several methods of arch predetermination or survey in order to arrive at his conclusions.

It was only a few days ago that a dentist sought my counsel. He presented an upper model of a denture, very narrow in the bicuspid region with protruding incisors. The single model had all the characteristics of a severe distoclusion (Class II) case, even though the lower model was not at hand to prove the relationship. The model was accompanied by a single film of the upper right cuspid region, which revealed a deciduous cuspid in place with a badly positioned unerupted permanent cuspid in the palate. The case presented one of the worst pitfalls imaginable. It would try the patience and skill of an experienced orthodontist. It was this dentist's first case of orthodontia, and he wanted "just a little advice as to how to start."

A junior student at Northwestern University Dental School asked my advice recently regarding his teeth. On examining his mouth, I was at once aware that he had at some time worn an orthodontic device. Inquiry revealed the following facts: At 12 years of age, he had had his upper teeth straightened by a dentist in his home town (a man whose name would be recognized by a majority of you). The young man insisted that the lower arch had never had appliances placed on it and that the upper arch was treated for two years or more for protruding front teeth. This was obviously a distoclusion (Class II) case, and it still is. The clinical picture today presents a serious condition. The mouth exhibits abundant evidence of pyorrhea, the upper incisors still protrude, the arch is excessively overexpanded in the bicuspid region, there are spaces between nearly all of the upper teeth, the lower incisors and cuspids are all in excessive supraversion and the bicuspids entirely in lingual relation to the upper teeth. I suspect that the original condition of this mouth called for routine Class II, or distoclusion, treatment. The pitfall here was that this man, in spite of his prominence as a dentist, had no conception of the conditions underlying the case.

Some time ago, the son in an intelligent, wealthy family was brought to me for consultation. He had been under the care of a prominent dentist for several years, "having his teeth straightened." The case was characteristically one of those caused by the premature extraction of the upper deciduous first molars and cuspids to make room for the erupting permanent teeth. The result was that the maxillary bicuspids and first molars erupted and drifted considerably mesiad from their normal positions, and as the permanent cuspids erupted, they occupied a very unsightly labial position. The dentist proceeded to expand the upper arch to make room for the cuspids. The result was a pronounced overjet or labioversion of the upper anterior teeth. The case had been dismissed as finished. Again the dentist had failed in his diag-

nosis. From a comparatively easy condition for the orthodontist to treat, the case had resolved itself into a very difficult one, necessitating the backward movement of the entire upper arch and an equalizing forward movement of the lower.

The fallacy of undertaking to treat malocclusion without ample roentgen-ray evidence to aid in establishing a diagnosis is illustrated by another case from my own practice. I smile when I think of it. I did not yet have my own roentgenographic outfit, and the service was expensive in those days. A little girl of 9, with a very badly protruding upper central incisor, was brought to me for treatment. I thought this case was going to be "easy money," because there was ample room in the arch for this offending tooth. Appliances were placed and retractive force was set to work. But my plan did not work out well. More force was applied, and, a little later, to my astonishment, I observed a swelling in the palate, and one day there erupted a club-shaped supernumerary tooth. It was extracted, and the case retreated; and retainers were finally placed, and were eventually removed. In a few months, my patient returned—the tooth was in its former malposition! One pitfall at a time was enough for me. This time a roentgenogram was taken, only to reveal a second supernumerary tooth, which was removed. The case was again treated, this time with success.

We hear a great deal about the efficiency of some of the newer appliances of the present day, and a word of caution regarding their use may help some one to avoid a pitfall. Appliances calling for a multiplicity of bands, and the firm attachment of teeth to an alinement wire, should be used with extreme caution, and only by experienced operators. I recall the sad case of an experienced orthodontist who was making use of the pin and tube appliance when it was first introduced, about twenty years ago. This mechanism was positive and efficient in its action. It would do all that its originator claimed for it in the moving of tooth roots. The orthodontist in question was skilled, but he did not realize the pitfall which lay in wait in the use of one of these appliances. Before he was aware of it, the roots of several lower incisors (because of the unseen power within these pin and tube connections) had been moved completely through the labial plate of bone and were denuded of the overlying gum tissue. Fortunately, this type of appliance was short-lived, but a similar danger lurks within any appliance thus fixed and rigid.

The roots of teeth offer pitfalls of several varieties, and I cannot urge too strongly the frequent use of roentgenograms of these parts. If you have ever had the experience of trying to rotate a tooth with a curved or bayonet-shaped root, you will appreciate the importance of the roentgen rays. If you have ever tried to rotate or otherwise move a lateral incisor, not knowing that the crown or enveloping sac of an unerupted cuspid was in contact with the incisor root, you will appreciate the suggestion. The tips of the roots of some permanent teeth sometimes become absorbed in an unaccountable manner. This absorption has been charged against orthodontic interference. Roentgenograms taken before treatment absolve the orthodontist of this charge. The congenital absence of teeth has a marked influence in diagnosis and treatment. Again, the roentgen rays become an invaluable aid. It is extremely embarrassing to treat a case for months and months, opening spaces only to find that no tooth is present. This, of course, necessitates a change in treatment.

Habits may be responsible for a most

unexpected pitfall. Unfortunately, some of these involuntary acts which become very firmly established in the child, are often permitted and encouraged by the parents. Unless the dentist is familiar with them, they may cause him no end of trouble in his effort to correct irregularities.

The use of the pacifier by little children usually results in a deformation of the maxillary bones, with a protrusion of the upper incisors, and, often, an opening of the bite. The same is true of thumbsucking and fingersucking.

I recall another incident from my practice. A little girl about 8 years of age, with the upper central incisors definitely protruding, was placed under my care. The case was treated and retention continued for a time. Soon after the retainers were removed, the teeth relapsed to their former position. The treatment was repeated in much the same manner as the first attempt, and with the same result. One day as the child was reading, while waiting, I observed that she was nervously engaged in biting the glands of her lower lip with the offending central incisors. The cause of the relapse was thus discovered. Fortunately, the mother was of the intelligent type and cooperated with me. The habit was broken, and, after the third trial, the teeth have remained in alinement.

Then there is the story of the child who imitated his father. They were my neighbors. The father had a pronounced lower protrusion. The 6-year-old son, to the delight of his parents, imitated this protrusion, and one day the upper central incisors were found to be in lingual relation to the lower teeth. It was the beginning of a mesioclusion (Class III) case. In the face of my repeated warnings against this cunning trick, and even in spite of the obvious evidence, these parents insisted that it would correct itself. It was corrected only after the child become my regular patient.

All malocclusion has a simple beginning, and most of the cases become progressively worse. These brief references must serve to emphasize the necessity for trying to discover unsuspected causes.

It is most difficult to discuss comprehensively a highly specialized branch of any science or art in a limited time. Such an attempt brings to mind the ladies' literary society that tries to encompass Shakespeare in one afternoon.

Harvey Cushing, in his presidential address before the American College of Surgeons in Boston, in 1922, chose as his theme the following quotation from Lanfranc: "No one can be a good physician who has no idea of surgical operations, and a surgeon is nothing if ignorant of medicine."[4] Written in terms expressive of the spirit of this paper, let us paraphrase: No one can be a good dentist who has no idea of orthodontia, and an orthodontist is nothing if ignorant of dentistry.

4. Cushing, Harvey: Presidential address, Tr. Am. Coll. Surgeons, 1922.

DRUGS AND THEIR USE IN THE DENTAL OFFICE

By JOHN ALBERT MARSHALL, D.D.S., Ph.D., San Francisco, Calif.

THE first care of the dentist is the sterilization of instruments and dressings. This is done by the use of either steam or chemicals. For cutting instruments, the use of 50 per cent compound solution of cresol, U.S.P., is long-established hospital practice. Engine handpieces, with the exception of those having a vulcanite or similar grip, can be placed in an autoclave together with other instruments, as matrices, pliers, forceps, plastic instruments, cotton dressings, napkins, rolls, paperpoints and pellets. After twenty minutes at 15 pounds pressure, the regulator handle is turned to the "vacuum" position. This draws off the steam and dries the various articles. The handpiece may then be further wiped dry with a sterile towel, and, when cooled, it is oiled for use.

The method by which drugs are applied or used often determines the success or failure of the treatment. For example, oil of cloves has been recommended for many years to quiet an aching pulp; but the commercial article (U.S.P.) contains irritating substances which may counteract the sedative effect. Instead of oil of cloves, the active constituent, eugenol should be used. It is an oily liquid and does not mix with water; therefore, unless it is placed on dry dentin, there is some loss in the therapeutic effect; for oil and water do not mix any better in the tooth than in a pan.

Patients dislike disagreeable odors, especially those given off by such drugs as creosote and iodoform. If proper bottles were readily available, which were airtight, there would be less difficulty from this source. But manufacturers of cabinets and of bottles fail to grasp the requirements for dental glassware. These requirements are simple. Since many drugs and chemicals are subject to deterioration on exposure to the light, the first specification is that all dispensing bottles be made of amber glass. The amber is not unsightly and reduces to the minimum the effect of sunlight. The second requirement is just as important, but more difficult to meet. The containers, some of 1 ounce capacity, and some of 2 or 4 ounce, should be designed like the old "ether bottle," so called because ether can be kept in it without loss by evaporation. It has a ground glass stopper and a ground glass cap which fits tightly at the neck near the shoulder. The top of the cap on the outside has a small depression large enough to hold a few drops of liquid. When a medicament is required, the cap is removed, then the stopper, and the necessary amount of liquid is poured into the depression on the cap. Then the stopper and cap are replaced. To facilitate pouring, the neck should have a small lip Hydrochloric acid, nitric acid, sulphuric acid, tincture of iodine, creosote and similar drugs and chemicals can be stored in bottles so designed. The unused liquid is discarded, not poured back. Furthermore, it is unnecessary to continue the very objectionable procedure of dipping a pair of cotton pliers into the bottle

But, until some enterprising manufacturer makes these special containers, the old way (messy and unsanitary, to use the mildest terms) of dipping out the liquid will probably be continued in many offices.

Phenol in concentrated solution cauterizes tissue. A small ulcer on the gum or a fistulous opening may be lightly touched with a pellet of cotton barely moist with phenol. One such treatment is usually enough. A second cauterization should not be carried out until the effect produced by the first application is determined. Concentrated phenol is useful in treating sensitive dentin and in extirpating residual filiaments of pulp tissue. When a drop is carried to the apical portion of a pulp canal under treatment, it produces a slight coagulation of the protein material. Frequently, a "weeping canal" will be dried up in two or three days, for the coagulum seals off the small capillaries that ooze serum and serous exudate into the canal.

Alcohol is an indispensable drug as well as chemical. The most useful concentration for the sterilization of instruments is a 70 per cent solution. The usual strength, 95 per cent, serves the purpose of flaming instruments, such as cotton pliers. When sterile dressings are to be used in pulp canal treatments, the following procedure should be adhered to:

The freshly autoclaved cotton pellets and points are transferred to a sterile 3 or 6 inch petrie dish. The cotton pliers are flamed in 95 per cent alcohol by placing the tips of the pliers in alcohol and then passing through the gas flame. When the ignited alcohol has burned off, the pliers may be introduced carefully under the cover of the petrie dish and the dressings carried from the container to the tooth. Thus, the danger of contamination to unused dressings is reduced to a minimum. Each time a point or pellet is required, the same procedure is followed.

Both aqueous and alcoholic solutions of iodine are necessary in the list of drugs. The aqueous solution may be easily prepared by first dissolving potassium iodide in water and then adding a few crystals of iodine. This is similar to the so-called "disclosing solution," and when applied to tooth enamel, readily stains the detritus and film which may remain on the surface after preliminary cleaning and polishing. The alcoholic solution should be freshly prepared. When applied to the oral mucosa, it is useful in producing counterirritation, frequently of aid in the treatment of pericementitis.

Viogen is a mixture of two dyes: crystal violet and brilliant green. It stains the mucous membrane very deeply for a period of twelve hours, when it is gradually dissolved and removed. In the treatment of suppurating surface wounds, either in the mouth or on the skin, it is of outstanding importance. The formula is as follows:

1 gm. each of crystal violet and brilliant green in 100 c.c. of 50 per cent alcohol.

Crystal violet must be had, as methyl violet or gentian violet are different substances.

Aromatic spirits of ammonia is indicated when the patient appears to be fainting or is recovering consciousness too slowly. The average dose is 30 minims or about 2 c.c. diluted in one-third to one-half glass of water.

Beechwood creosote aids in the sterilization of infected pulp canals. To some, its odor is disagreeable. It produces, as does concentrated phenol, a hard coagulum of protein. The pure solution, cautiously applied on a small

paper point, may be placed for a few days in a pulp canal for purposes of sterilization. The diluted solution containing about 10 per cent aqueous formalin (formaldehyde) solution is used for the same purpose.

One of the most uniformly satisfactory drugs for the treatment of pulp canals is dichloramin T. A 3 or 5 per cent solution is prepared by dissolving the powder in chlorcosane previously warmed to about 120 F. It must be kept in a dark amber glass stoppered bottle. A cork or rubber stopper tends, like all organic substances, to decompose this drug. Moisture and dust likewise must be carefully excluded. Dichloramin T may be introduced into the pulp canal directly, and even forced gently through the foramen. In this respect, it is different from such medicaments as formocresol. Another very useful drug is merthiolate (solution No. 45), a new mercury compound prepared in a 1:1,000 aqueous dilution. Some of the most obstinate cases of chronic apical abscess respond satisfactorily to this new drug.

Posterior teeth oftentimes present difficulties in root canal treatment on account of curving of the roots. Little difficulty is experienced in opening perhaps the gingival half of the canal, but the apical half may be almost inaccessible. For such cases, the application of Howe's ammoniacal silver nitrate is indicated. Instead of precipitating the silver with formalin, as originally specified, it is better to use eugenol.

Chloroform is the solvent used for two important solutions in pulp canal therapy: chlororesin and chloropercha. It should be of highest purity and kept in a dark amber bottle tightly stoppered. Chlororesin is made by dissolving 10 gm. of the highest grade violin bow resin (the Bernardel product is most satisfactory), 1 gm. of thymol and 0.5 gm. of menthol in 100 gm. of chloroform. Chloropercha is made by dissolving 10 gm. of pink baseplate guttapercha in 100 gm. of chloroform. This solution also should be stored in a dark amber bottle similar in design to that described in a preceding paragraph.

(To obtain the best results with these solutions, it is necessary that the canal be dry and sterile. The pulp canal may be dried after sterility has been obtained, by making several applications of 95 per cent alcohol and each time removing the liquid by dry sterile paper points. The residual alcohol is removed by applying chemically pure acetone. The residual acetone is removed first with dry paper points, and the last traces are volatilized by inserting carefully into the canal a pulp canal drier. This consists of a 10-gage platinum wire about 1½ inches long. One end is filed to a fine point and the other is soldered to a ball of silver about one quarter inch in diameter. This ball is soldered to a steel cone socket handle, not an aluminum one, and also to the wire.)

In the treatment of infected mucosa, a solution of aromatic chlorazene powder gives good results. A third of a teaspoonful of the powder dissolved in one-half glass of water makes a very effective mouth wash. Another drug indicated also as a mouth wash is potassium permanganate in a dilution of one part to 200 of water. It is also a deodorant.

There are three other drugs of general use which may serve on occasion a very important purpose, namely: barbital, morphine sulphate and atropine. There are a great number of so-called sedatives which are chemical derivatives of barbituric acid. Some of these are very expensive, but none of them possess any distinct advantage over barbital. It is

used in a 5 to 7½ grain dose with a hot drink as a prophylactic for local anesthetic toxicity. Morphine sulphate in doses of a quarter grain may be prescribed in the treatment of extremely nervous persons, especially those who fear dental operations. Atropine, one twentieth grain by mouth, serves to reduce, temporarily, the amount of salivary secretion.

The dental profession for years has been exploited by many unscrupulous manufacturers of drugs, tooth pastes, tooth powders and various mouth washes. It is time to get rid of this incubus. The blandishments of the salesmen sometimes are interesting, but usually are so filled with untrue statements as to constitute a fraudulent misrepresentation or suppression of facts. For example, take the statement: "This substance removes 95 per cent of the bacteria in the mouth." That statement is probably true, but the manufacturer forgets to point out that warm water also will remove 95 per cent of bacteria in the mouth. The various mouth washes leave a pleasant taste, and their sale provides a means of easy livelihood at the expense of the uninformed public. If the statements of the manufacturers were not so absurd, and if the prices of these various solutions were more reasonable, it is quite probable that there would be less criticism of the various products. At present, the old adage of Benjamin Franklin certainly applies to mouth preparations: "We pay too dear for the whistle."

It is a source of chargin to the dental profession that this condition of exploitation has developed to the present extent. It is to correct this condition that the Council of Dental Therapeutics of the American Dental Association is publishing from time to time critical reports on the various products submitted. Cooperating with the Council are many governmental and lay organizations, such as the Food and Drug Administration and the National Better Business Bureau. These, as well as other groups, write to the Council for information. By frequent broadcast programs, the various so-called "rackets" are being exposed, and the dentifrice and tooth paste racket is, in some respects, one of the worst. But the work of the Council goes for naught if the profession disregards the published reports on goods made by unscrupulous manufacturers. Are dentists so gullible that they will continue to pay 50 cents or a dollar for a bottle of water that contains a few grains of salt or soda and a little coloring matter and flavoring extract? Is the public so gullible, or so indifferent, that they will continue to pay hard cash for a product that is practically worthless? Have the American people become so sold on advertisements; are they so bombarded with "bunk," that the national gesture is to hand out cash automatically for a fraudulent article? Perhaps the public is less to blame than the editors and business managers of the various trade journals. Any periodical supported by advertisements must have due regard for the products that pay the printer. Comments of a critical nature which may injure the sale of a product are blue penciled by the editor. When advertised claims of an item state only part truths or even less, the patient public pays, because it has been taught to believe that the printed word is truth, no matter where it is found. We pay too dearly for misinformation and not enough for information.

CENTRAL LESIONS OF THE LOWER JAW, THEIR RECOGNITION AND TREATMENT IN THE EARLIEST STAGES

By JOSEPH COLT BLOODGOOD, M.D., Baltimore, Md.

A TREMENDOUS change is taking place in the size and duration of lesions in the region of the jaws and teeth. I have already written on the subjects of the painful spot in the jaws, the loose tooth, the swelling of the alveolar border, the abscess and the swelling of the body of the lower and upper jaw. As lesions of the upper jaw include the antrum, they involve a different presentation from that of lesions of the lower jaw. Although the lower jaw has no distinct marrow cavity like a long pipe bone, it is somewhat like the latter in some of its diseases. Nevertheless, central tumors of the lower jaw are a distinct clinical, pathologic and therapeutic problem. In the beginning, when these various pathologic lesions are still surrounded by an intact bone shell, the patient is made aware of the presence of the lesion in plenty of time by a distinct palpable swelling. There need be no pain, nor a loose tooth, nor a swelling of the alveolar border. A spot in the symphysis, body or ramus, is enlarged. The patient feels it, as a rule, externally and not within the mouth. The patient is apt to consult a dentist first, and now is the time for two properly taken roentgenograms of the lower jaw and dental films of all the teeth. I have a sufficient number of these early cases to justify a clear description, a method of diagnosis and treatment. Resection is never indicated in this early stage. Theoretically, if the area of bone destruction does not indicate the presence of a dental root abscess, there should first be irradiation with deep roentgen rays or radium. Even in some of the larger dental root abscesses, irradiation is a possible treatment. I discussed this in 1924,[1] at which time I published letters on irradiation of dental root abscesses by Lewis H. Levy, of New Haven, Conn., Robert Burns, of San Francisco, Calif., and Robert H. Ivy, of Philadelphia. Undoubtedly, irradiation is unnecessary in many of the central lesions of the lower jaw, but, as there is always a possibility, although not a great one, that this small tumor is the beginning of a chondromyxosarcoma or a very rare osteogenic sarcoma, irradiation is a very good preparation for exploration. No harm is ever done to the benign lesion. The irradiation may temporarily check the benign lesion. In the case I reported in 1924, three teeth were loose. After irradiation, the cavity almost healed, and the teeth became firm and were useful for eight years. Quite recently, an abscess formed, an ordinary dental root abscess with an alveolar or "gum boil" swelling. This was incised

1. Bloodgood, J. C.: Correspondence, J. A. M. A., 82:1882 (June 7) 1924; Correspondence, D. Cosmos, 66:1270 (Nov.) 1924.

and pus evacuated eight years after the onset of the trouble. When I saw the patient last, a few weeks ago, the abscess was healed and the teeth were still in place, painless and firm.

We have sufficient evidence from observations of both tumors of the lower jaw and elsewhere that there is an element of danger in opening, either through the mouth, or externally, one of these central tumors of the lower jaw and then curetting out the contents without thermal or chemical cauterization, since, after a microscopic study, we may find out that we are dealing with a malignant tumor. It is safer to have some irradiation first. Then, when we do explore the central lesion of the lower jaw and are not prepared to make immediate frozen sections, it is safer, after thoroughly curetting the cavity and every recess opening into the cavity of all the soft-part tissue, to wipe the bone surface with pure phenol, protecting the mouth with an alcohol sponge, wiping the phenol out of the bone cavity with an alcohol sponge, and then mopping the mucous membrane with a salt sponge. The mucous membrane can then be protected with salt sponges and the cavity again wiped out with a piece of gauze saturated in a 50 per cent solution of zinc chloride. After this first mopping with salt solution to get rid of any possible alcohol, the cavity and its recesses can be burned with the electric cautery. There is a very convenient small electric cautery with small terminals which I have found useful for smaller bone cavities, for example, the cavity after the extraction of one or more teeth. Later, I shall report cases in which this method has been employed successfully in chondromyxosarcoma of the lower jaw.

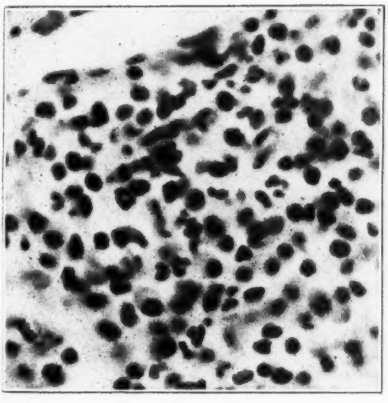

Fig. 1.—Typical granulation tissue from so-called dental-root abscess or granuloma. (High power.)

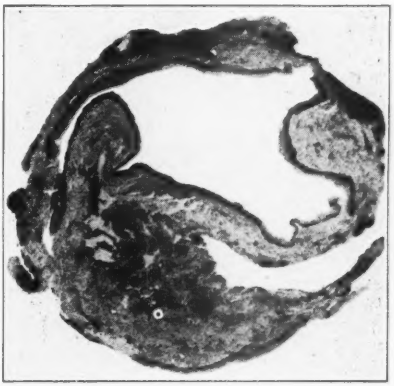

Fig. 2.—Entire section of a small dental-root cyst. The epithelial lining is like that of a dermoid cyst.

Let me mention a case or two to illustrate the danger of opening these central tumors of the lower jaw either from within or from without, incompletely curetting them and failing to use thermal or chemical cauterization.

Let me repeat here that in the dental root abscess, in the dental root and den-

tigerous cyst and perhaps in the fibroma, preliminary preoperative irradiation and chemical and thermal cauterization are unnecessary. But in the giant-cell tumor, in the fibrosarcoma, the adamantine epithelioma or carcinoma, in the chondromyxosarcoma and osteogenic sarcoma, prevention of recurrence, prevention of resection of the lower jaw or even preservation of the life of the patient may depend on the first treatment when the central tumor of the lower jaw is exposed, and it is my opinion that preoperative irradiation is another measure

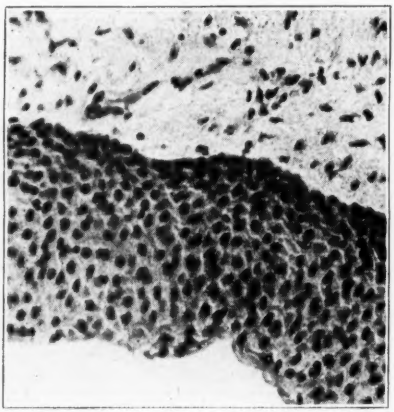

Fig. 3.—Epithelial lining of dental-root cyst illustrated in Figure 2. (High power.)

that will act as a safeguard.

I have described two cases, one in the son of a New York physician who was taken to the foremost New York surgeon at about 15 years of age because of a very slight swelling of the body of the left lower jaw. At that time, there were few pathologists who knew much about diseases and tumors of the jaw. Most of the latter that came under the eye of a surgeon were so large that a complete resection of the lower or upper jaw was performed. Many of the patients lived for years without recurrence. This was the type of jaw tumor that I reported in 1904[3] and again in 1909.[4] Unfortunately for this patient, the operating surgeon had never known such a small tumor of the lower jaw to be anything but a cyst. He explored it through the mouth and found that it was not a cyst, but contained minute cysts and solid, friable, granular material. He curetted it out as one

Fig. 4.—*X*, area between slightly expanded roots of molar tooth. Above, right, two extracted molars. In the molar to the left is the tumor between the roots shown at *X*. It proved to be a dental-root cyst. Figures 2 and 3 show the microscopic appearance of a similar case.

would a large root abscess or a benign bone cyst and packed the wound with gauze, healing by granulation ensuing. There were many good pathologists in New York and all were interested in

2. Bloodgood, J. C., in System of Surgery (ed. Dean Lewis), Hagerstown, Md.: W. F. Prior Co., Inc., 1930, vol. 4, chap. 4.

3. Bloodgood, J. C.: J. A. M. A., 43 (Oct.) 1904.

4. Bryant and Buck: American Practice of Surgery, 1909, Vol. 6, p. 813.

this rare jaw tumor. William Welch, professor of pathology at Johns Hopkins University, recognized it as an adamantine epithelioma or carcinoma. The patient died twenty-nine years later with the same type of tumor in the brain. Previous to his death, the posterior root of the gasserian ganglion had been divided to relieve pain and fortunately it did relieve him for the few months that he had to live. After this first operation of curetting, there were numerous recurrences, until, finally, the entire left lower jaw was removed. The young man became a prominent surgeon in

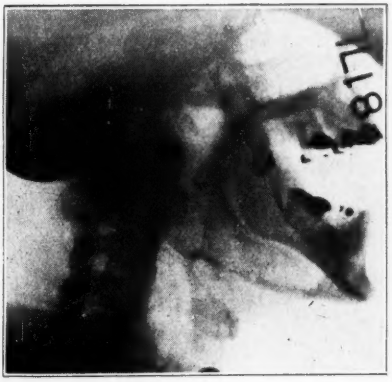

Fig. 5.—Roentgenogram taken three months after extraction of three loose teeth. The condition, diagnosed dentigerous cyst, proved to be a spinal-cell carcinoma originating in the gum, growing down and loosening three teeth. In the original roentgenogram, there was no such picture.

New York. I saw him after a long period of freedom from recurrence and function was remarkable in spite of the fact that the entire left lower jaw had been removed. We discussed his case before a dental society when he was apparently free from disease, and he stated that he could eat beefsteak. About six years before his death, he came to me with a recurrent nodule in the scar, the size of a 50-cent piece, just in front of the ear under the facial nerve. I isolated the facial nerve, sewed it up in muscle and then removed the tumor by blunt dissection. Today, I would remove it with the cautery and sacrifice the nerve. The tumor which I removed proved to be the same adamantine carcinoma, identical with the tumor described by Welch.

There was a free interval during which the patient did excellent work, another recurrence and another opera-

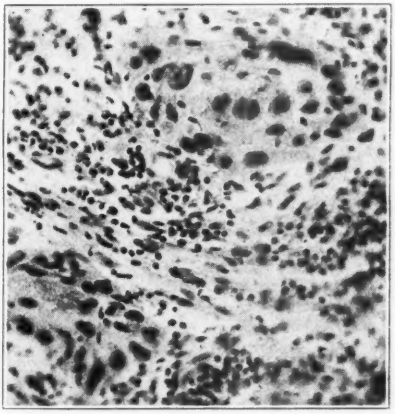

Fig. 6.—Section from tumor shown in Figure 5; spinal-cell carcinoma. (High power.)

tion sacrificing the nerve, then the gasserion ganglion operation, and then death from a definite brain tumor.

These adamantine carcinomas do not metastasize, but they recur when incompletely removed, and now and then we have accomplished a cure, even after a recurrence. At about the same time that this young boy was operated on for the small central tumor of the lower jaw with the curet, Dr. Halsted resected a huge tumor of the left lower jaw, and

this tumor was of twenty-nine years' duration. I followed this patient thirty years and there was no recurrence. In 1904,[3] we had observed twelve cases of adamantine epithelioma. Four appeared as epulides on the alveolar border of the jaw, three on the lower and one on the upper jaw. In eight cases, the tumor was within a bone shell, one on the upper and seven on the lower jaw. The tumors were clinically identical with dentigerous cysts, of which we had about an equal number of cases: ten, four on the upper jaw, four on the lower, two in the ethmoid bone. Even with these huge tumors

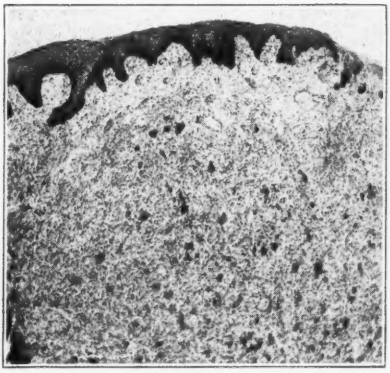

Fig. 7.—Benign giant-cell tumor. Giant cells of the epulis type predominate. The epidermis is from the gum. (Lower power.) Figure 8 is a high power photomicrograph.

of long duration, there was no clinical differentiation. They were so large that we removed them in their entirety. We discovered their pathologic nature only after operation.

In 1904, I knew that in the majority of cases of adamantine epithelioma, the patient remained well after a complete resection. I traced the cases then from one to twelve years. There was one local recurrence, but the patient remained well eight years after a second operation.

In giving a clinic recently in a large charity hospital in a large city, a colored woman was brought in with a moderately large expanding tumor of the left lower jaw involving the ramus and the angle and a portion of the body of the lower jaw. There was nothing in the roentgenogram to reveal the character of the tumor. The tumor had been previously operated on while it was a small cyst at the angle of the jaw. The fluid in the cyst had been drained through the mouth, and no tissue had been obtained for diagnosis. It was looked on as a

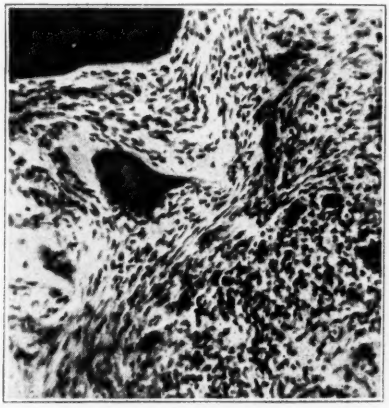

Fig. 8.—Benign giant-cell tumor; very few giant cells; very cellular stroma, spicules of bone. (High power.)

benign dentigerous cyst. My studies show conclusively that the adamantine carcinoma may be associated with a definite cyst, and one may explore and drain the cyst and miss the adamantine carcinoma, and, of course, there will be recurrence. I pictured such a case in 1904.[3] I pictured another such case in 1909,[4] and I reported a similar case in 1924.[5]

5. Bloodgood, J. C.: Method of Operative Attack for Central Lesions of Lower Jaw, New York J. Med., 24:379 (March 21) 1924.

To return to the colored woman with the recurrent tumor of the jaw: The next day the involved jaw was completely removed. The tumor had broken through the capsule and tumor tissue had infiltrated about the temporomaxillary joint. The tumor was no longer a cyst, but a solid adamantine carcinoma, and tumor tissue was left behind in the region of the joint as the patient was in shock and the cautery will have to be employed at a second operation. What a simple procedure complete removal would have been, if the operator had known that a cyst may be associated with a solid adamantine carcinoma. All he had to do was explore a little farther. Again, simple drainage of the cyst is not sufficient for the permanent cure of a dentigerous cyst. One must remove the connective-tissue lining. In doing this, the operator will always expose the evidence of an adamantine carcinoma, and can act accordingly.

In the case just mentioned which I reported in 1924,[6] the roentgen-ray picture of the recurrent tumor suggested a benign dentigerous cyst. In the history, the swelling in the region of the ramus of the left lower jaw had been present twelve years. This area had been drained twice through the mouth, three and six years ago. It was now a big, but not a huge, swelling. The thin expanded bone shell was intact. There were some remains of the body and ramus of the lower jaw of sufficient strength, if I could save it, to guarantee good function. There remained an unerupted tooth which, continuous studies demonstrate, is not diagnostic. I knew that I could remove the expanded portion of the thin bone shell better by an external incision, and I also knew that I could get rid of the adamantine carcinoma, if present, best through an external incision. I turned a skin-muscle-and-periosteal flap; and I exposed the bone shell as clean as the shell of a boiled egg. When I opened the shell there was a solid and cystic tumor of the gross characteristics of the adamantine carcinoma.

Fig. 9.—Chondrosarcoma. A high power photomicrograph of sarcomatous areas is seen in Figure 10.

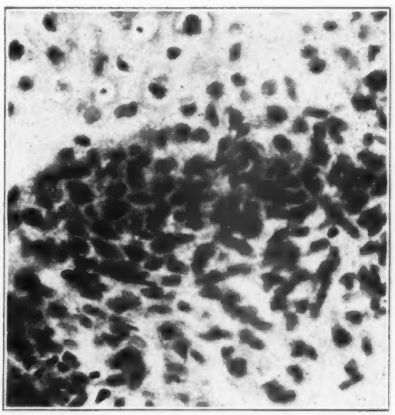

Fig. 10.—Sarcomatous areas in chondroma. (High power.) A low power photomicrograph is seen in Figure 9.

Frozen sections were confirmatory. Everything within the bone shell was removed. I think it is best here to copy my exact technic as it appears in the article, where it is stated that it is copied verbatim from the operative note. In the first place, it was done under procaine. The operation was performed in February, 1921. The skin incision corresponded to that used for the external exposure of the inferior dental nerve, curved downward over the body, angle and ramus of the lower jaw. It did not injure any important motor nerve. It continued down and divided the periosteum, and then the periosteum with all the tissue between it and the skin was stripped from the bone until we exposed a dome of bone shell as large as an orange. This shell extended from the mental foramen to the zygoma. The bone shell gave parchment or ping-pong crepitation; yet I could not burn through it with the cautery. For this reason, I covered the soft parts with alcohol sponges and removed a piece of the bone shell the size of a silver dollar. First, there escaped some clear fluid which was mopped up with alcohol sponges. The cavity was filled with red, friable granulation tissue with many white opaque areas (I was familiar with these white opaque areas as the typical gross appearance of adamantine epithelioma, but the red friable granulation tissue was an unusual picture). This mottled coloring (red) resembled that of the giant-cell tumor, but the granules were coarser and larger. There were no partitions in the bone cavity. The expanded bone shell, on the inner side, was smooth and thin. There was no connective-tissue lining. Immediately, we removed the tumor tissue with phenol followed by alcohol and then swabbed with a 50 per cent solution of zinc chloride. We then used the cautery, before which all the sponges around the wound were changed to gauze wet in salt solution (fire protection). By this time, we had the frozen section report. I looked at the section—it was quite typical of adamantine epithelioma. There was no pain until the

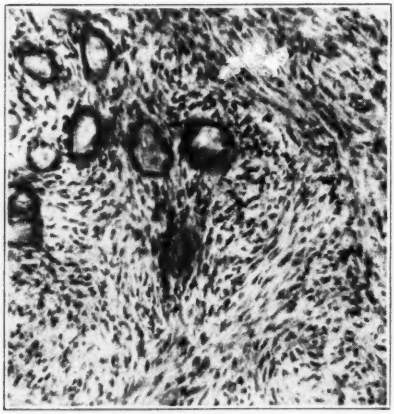

Fig. 11.—Fibrospindle-cell tumor, either benign or a very low grade of malignancy. (Low power.)

Fig. 12.—Fibrospindle-cell tumor, probably a low grade sarcoma. (High power.)

nerve was exposed. It was injected with 4 per cent cocaine and was found to pass through the tumor. On a portion of the body of the lower jaw which showed in the roentgen-ray film (the thin expanded bone shell did not show in the film), there were here and there little recesses filled with tumor tissue. (I am inclined to think that many recurrences after curetting the adamantine carcinoma and the benign giant-cell tumor are due to failure to expose and curet these recesses. They are more likely to be found in the remaining bone that has not yet been expanded. They are never found in the thin bone shell, but not infrequently the thin bone shell is perforated and tumor tissue has infiltrated through and is present outside the bone shell. Failure to expose these areas and to remove them explains recurrences. Preoperative irradiation may be helpful, at least in the giant-cell tumor, to insure against such recurrences. I have not had sufficient experience with irradiation of the adamantine carcinoma to know its value as a preoperative treatment. So far, the evidence is against the conclusion that an adamantine carcinoma is radiosensitive).

To return to the operation: These little recesses were treated with chemical and thermal cauterization. All visible tumor tissue having been removed, the thin expanded portion of the bone shell was removed subperiosteally until it joined the thicker portion of the shaft, angle and ramus of the jaw. A nonerupted molar shown in the roentgen-ray film was removed. In removing the bone shell on the mucous membrane side, we encountered a small perforation of the shell through the mucous membrane communicating directly with the mouth. The opening admitted the little finger. The bone about it was smooth. The patient was unaware of its presence and we did not find it before operation. We trimmed the edges of the perforation of the mucous membrane and closed with silk tied on the inside of the mouth. We had now removed everything, except a small portion remaining of the body, angle and

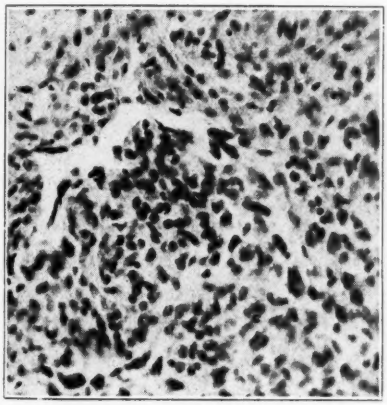

Fig. 13.—Cellular sarcoma, malignant type. (High power.)

Fig. 14.—Typical, very malignant chondrosarcoma. (Low power.) (Compare Figure 9, less malignant form.)

ramus of the jaw as shown in the photograph. The flap of skin, muscle and periosteum was replaced without suture. For forty-eight hours, Carrel tubes were left in place and there was irrigation with surgical solution of chlorinated soda. As there were no bacteria in the secretions, the tubes were removed and the skin flaps were fixed with adhesive straps. Healing was rapid.

I have examined this patient within the past few months. There are no signs of recurrence now, almost 12 years after the operation. There is no restriction of motion.

This method of curetting with chemical and thermal cauterization and preservation of the continuity of the lower jaw has now been tested on an adamantine carcinoma of considerable size, recurrent after two drainage operations, and has accomplished a cure. It has established this conservative procedure, in smaller tumors, even when they are recurrent. There is no doubt that, in the future, we will get more smaller tumors. I have established the fact in a number of cases of giant-cell tumor and have preserved the continuity and function of the lower jaw. I have performed the operation on a few occasions through the mouth and, ultimately, in smaller tumors, this may be the method of choice, In larger tumors, it is a risk. The operation through an external incision allows better exposure and more thorough chemical and thermal cauterization. I think the operation through the mouth should as yet be reserved for smaller tumors. To repeat, drainage of an apparent dentigerous cyst is not justifiable. The lining of the cyst must be removed, not only for the cure of the cyst, but also to exclude the possibility of adamantine carcinoma.

I wish to repeat that failure to find one or more recesses or perforation of the bone shell has been the best explanation of recurrences after curetting of the adamantine carcinoma and the giant-cell tumor. The chief explanation of the recurrence of a dentigerous cyst is fail-

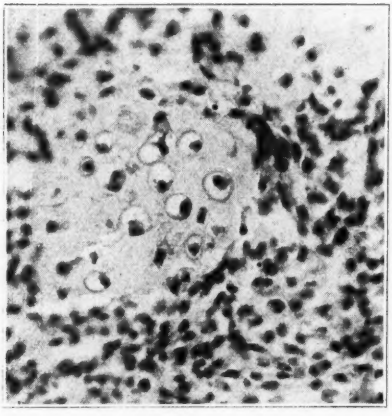

Fig. 15.—Very malignant chondrosarcoma. (High power.) (For low power, compare Figure 14.)

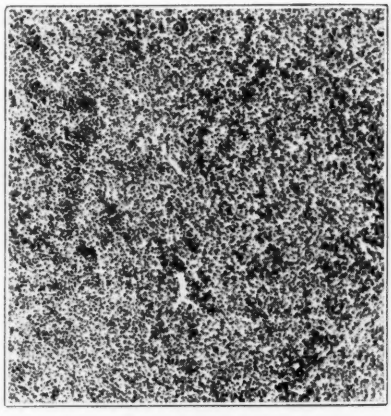

Fig. 16.—Round-cell sarcoma of the lymphosarcoma type. (Low power.)

ure to remove the connective-tissue lining.

GROSS AND MICROSCOPIC PATHOLOGY OF CENTRAL TUMORS OF THE LOWER JAW

My description given in 1904[3] was incomplete. I described and pictured everything I had seen,[4] but, in most of the cases, it was the clinical picture that gave the diagnosis, and the gross appearance was pretty clear. Less attention was then paid to the microscope. Practically all the pictures reproduced in Bryant and

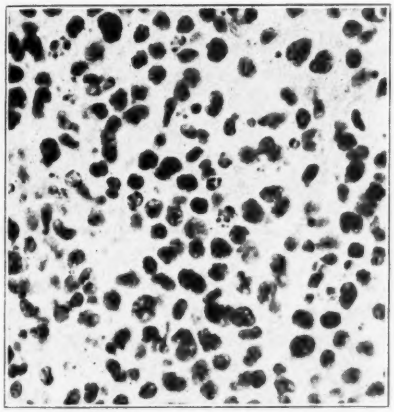

Fig. 17.—Section from area shown in Fig. 16. (High power.) This is a high-grade round-cell sarcoma of the lymphosarcoma type.

Buck were again reproduced in "System of Surgery."[6] Nevertheless, in 1909, I pictured the gross appearance of what we then called a periosteal fibromyxosarcoma. It was still surrounded by a thin bone shell of the body and ramus of the jaw. If it had been originally a central tumor as described by Blauel[7] the remainder of the bone shell has disappeared (my Fig. 567). Figure 574 shows the same tumor in the antrum. In the tumor of the lower jaw, there was resection, and the patient lived nine years. In the tumor in the upper jaw, there was also resection, and the patient lived fourteen years. These fibromas, fibromyxomas and fibromyxosarcomas are to be observed in the future in their very early stages, and I am convinced that they may be removed conservatively and the portion of the bone shell of any strength

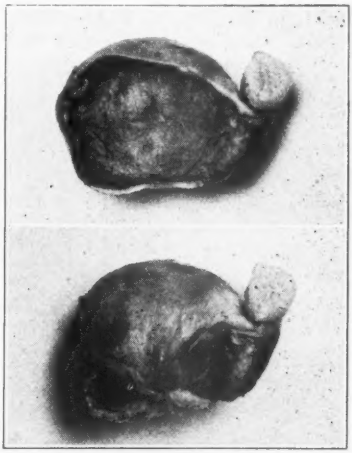

Fig. 18.—Gross specimen: Connective-tissue lining of typical dentigerous cyst. The epithelial lining was not unlike that shown in Figure 3, a dental-root cyst. In recesses, there may be areas like that shown in Figure 19.

preserved, and, with this, undoubtedly the function of the lower jaw. Our changed attitude toward the giant-cell tumor is shown in Figure 569 in my article.[4] Here, we see the photograph of an entire lower jaw, angle to angle. The tumor was present only in the symphysis. This complete operation was performed on the clinical picture only. The microscopic diagnosis was medullary giant-

6. Bloodgood, J. C., in System of Surgery (ed. Dean Lewis), Hagerstown, Md.: Prior and Co., 1930, Vol. 4, Chap. 4.

7. Beitr. z. Klin. Chir., 37:306, 1903.

cell sarcoma. The operation was performed in 1900, and the patient lived more than twenty years. This woman used to write me every Christmas: "I am glad for your and science's sake that I am living, but not for my own sake." It was a terribly mutilating operation. Today, we would be suspicious of the condition in the roentgen-ray film, and would irradiate it preoperatively. At exploration, we would be certain of the diagnosis from the frozen section. Remember that some types of adamantine carcinoma, multiple myeloma and hemorrhagic

Fig. 19.—Section of bit of tissue removed from recess near root at an operation for recurrent dentigerous cyst. (Low power.)

osteogenic sarcoma resemble in the gross the benign giant-cell tumor. I am sorry to record that the day of gross pathology is over. One should not rely on anything but the microscope. One will find in the Bryant and Buck article[4] much better colored gross illustrations than in anything I have published since.

Clinically, there will be a palpable tumor. As people come earlier and earlier after the first symptom and as it becomes the rule of preventive medicine to begin to take roentgen-ray films of the teeth at 7 years of age and continue them at intervals after that, perhaps the majority of these central tumors of the lower jaw will be found

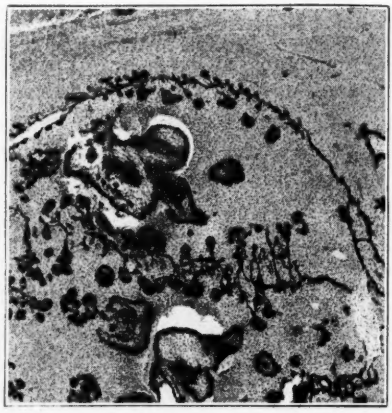

Fig. 20.—Typical malignant adamantine carcinoma, recurrent tumor. Other areas are shown in Figure 21.

Fig. 21.—Typical malignant adamantine carcinoma, recurrent tumor. Another area from the same tumor is shown in Figure 20.

in the routine examination in young people in searching for nonerupted teeth and in old people in looking for root

abscesses. I doubt that there will be much difficulty in distinguishing the nonerupted tooth from any of the central tumors of the lower jaw. The majority of roentgenograms of the dental root cyst will be typical and there will be no danger of overlooking a malignant tumor. Then there will be atypical roentgenograms, atypical of the dental root abscess or granuloma, and now and then atypical of a nonerupted tooth. These must be treated on the possibility of a central tumor of the lower jaw. Teeth must not be extracted or the central tumor explored unless the operator is prepared to use chemical and thermal cauterization and to make frozen sections. If frozen sections are not possible, tissue must be removed for section by a well-trained pathologist. This is a rule that every oral surgeon should follow. These precautions do no harm to the benign lesion, and they give the patient with a malignant tumor the largest possibility of a permanent cure with the least mutilation, the least discomfort and a minimal loss of time.

THE DENTAL-ROOT ABSCESS OR GRANULOMA

One rarely sees what a dental-root cyst or granuloma looks like. In the roentgenograms, we see a light area about the root, varying in size. When it is larger than a certain size, we should be suspicious of it. It is not necessarily painful. We extract the tooth and, as a rule, there is attached to one or more roots a soft, red mass of tissue the size of a duck shot or smaller. There is a difference of opinion as to what should be done to the remaining cavity. Some dentists curet, others do not. I know that you can burn out this cavity with a small electric cautery and destroy every particle of soft tissue without pain and without producing sufficient bone necrosis to interfere with healing. This is very important knowledge, because any dentist or oral surgeon who has a proper cautery can do this if he removes with the tooth anything suspicious. He can drop the tooth into 10 per cent formalin, cauterize the cavity, send the tooth immediately to a good pathologist, and, if malignancy is found, the patient is protected. There can then be immediate irradiation and further cauterization, and that may be all that is necessary to accomplish a cure. I knew very little about dental root abscesses or dental root cysts until I read the monograph of Perthes in the *Deutsche Chirurgie,* in 1907. I used this monograph in my article in Bryant and Buck's Surgery,[4] and I reproduced a gross and microscopic picture from Perthes. Every dentist is familiar with the roentgenographic appearance of a typical dental-root abscess, and the ordinary picture when the tooth is extracted. I wish they would not throw away the teeth to which are attached these granulation tissue tumors, but would send them to me in 10 per cent formalin. I have been unable to get, so far, enough to make sections for the microscopic loan collection. It is an important microscopic picture for pathologists to be familiar with. When I sent the section of a granuloma attached to the first tooth I had extracted for root abcess, my pathologist colleagues diagnosed lymphosarcoma, and when this section is submitted to the visiting pathologists during the microscopic demonstration, the minority always diagnose lymphosarcoma. There is no necessity for me to tell my readers any more about the dental root abscess, cyst and granuloma, as discussed under the dental-root abscess.

DENTAL-ROOT CYST

Kegel, while a Johns Hopkins medical student, made an exhaustive study of the central tumors of the lower jaw in the Surgical Pathological Laboratory, especially of the dentigerous cyst and the adamantine carcinoma. I give reference here to his publication, and I hope within a few months an article will be published by him in this journal. Kegel is of the opinion that some of the dentigerous cysts so diagnosed by me, some of whch were published in the "System of Surgery," are really dental-root cysts and not dentigerous cysts. He bases his distinction on the character of the epithelial lining of the cyst. He is of the opinion that the small cyst which I reported, with illustrations in this journal, in my first article, is a dental root cyst and not a dentigerous cyst. I advise the reader to refer to the case in that journal. It is unique, remarkable and fundamental. In brief, a physician had a pain in a molar tooth on the right lower jaw. The roentgen-rays showed no root abscess. It simply pictured two roots of a molar tooth spread apart more than normal roots should be. Both the dentist and the roentgenologist were so suspicious that the patient with his roentgenograms came to Baltimore. When I extracted this molar, with one on each side as I feared malignancy, I found in the central tooth, between the roots, a small tumor apparently encapsulated. It was smaller than a small pea, about 4 by 5 mm. I thought that it might prove to be a rare dental root sarcoma which I had read about once in a French medical journal. It proved to be a cyst lined with epithelium. I interpreted the epithelium as that of a dentigerous cyst. Kegel is of the opinion that it is a typical dental root cyst. In this case, fearing malignancy, I thoroughly burned out with the electric cautery all three tooth sockets. It was my first experience and established the rule. It was not painful. It may have delayed healing a few days. The patient is living today and there has been no further discomfort after more than ten years.

In a second case which I reported,[7] Kegel is of the opinion that the lesion is a dental-root cyst and not a dentigerous cyst. The patient, a man over 70, had some discomfort and a little swelling on the alveolar border near the incisors. A roentgenogram was taken, a root abscess diagnosed and the tooth extracted. The sinus never healed. When I explored the sinus under procaine, I found a small bone cavity near the position of the root cavity lined by a definite connective tissue. When frozen sections showed an epithelial lining, I diagnosed dentigerous cyst. The differential diagnosis between a dental root cyst and a dentigerous cyst is apparently unimportant. Apparently, it is essential that the connective-tissue lining be removed and every recess be explored. The use of the diathermy electric needle in these very small cysts and in searching for small recesses is more valuable than the use of even the smallest electric cautery needle.

DENTIGEROUS CYSTS

Like the benign bone cyst, now and then the dentigerous cyst may have no visible connective-tissue lining. Figure 189 in "System of Surgery"[2] illustrates a roentgenogram of a large apparently cystic tumor of the lower jaw. It had been present some years in a woman of 22. It is the largest cystic tumor of the lower jaw that I have ever explored through the mouth. The operation was

7. Footnote 2, Fig. 182.

performed in 1915. Under procaine, I turned back a mucoperiosteal flap. The bone shell was blue and could easily be removed with the knife and scissors. I was surprised to find no connective-tissue lining that I could remove. The teeth, which were all intact in the roentgen-ray films, seemed normal. The roots were covered by a transparent membrane. I felt that it would injure the teeth to try to remove this membrane, which did not have the character of the usual membrane lining these cysts. The inferior dental nerve, which could be seen at one point, was tender. We removed the shell of bone beneath the mucoperiosteal flap, wiped out the cavity with iodoform gauze and replaced the flaps and sutured them loosely with interrupted fine black silk. Complete healing took place. It is seventeen years since the operation, and there has been no recurrence and, as far as I know, no loss of teeth. The question is, what kind of a cyst was it?

This is a unique observation. In 1902, thirty-one years ago, in exploring the bone expanding cystic tumor of the humerus, I found the same kind of thin bone shell, but it did not look blue, but dark like the bark of a tree. When I removed the bone shell, a clear and viscid fluid escaped. All that was done was to wipe out the bone cavity with a piece of iodoformized gauze. It is to be remembered that, in those days, we used iodoform gauze as an antiseptic. It took seven years for this bone cyst to consolidate. After ten years, the bone was restored to normal. I have records of a few other cases of bone cysts in which the operators told me that there was no connective-tissue lining, but I have no other dentigerous or dental root cysts in which it is recorded that there was no lining. These are unique cases and must be borne in mind.

The dentigerous cyst may be polycystic, and the single cyst of the polycystic tumor may have no connective tissue lining, but these are rare observations. In a dentigerous cyst of the lower jaw operated on by a colleague of mine, there was recurrence in spite of thorough cauterization through an external incision. At reoperation, through an external incision, I found a reformation of the connective-tissue lining, and in a little recess or pocket, near the root of an anterior tooth, a bit of tissue which, under the microscope, resembled a cystic adamantine epithelioma. This recess and the entire cyst were subjected to thorough chemical and thermal cauterization. There has been no recurrence after a number of years. There is no doubt that people live with dentigerous cysts many years, and the cyst may remain quiescent or it may be drained from time to time. In one of my observations, the patient is still wearing a silver tube with comfort more than ten years after its introduction. It is my opinon that the dentigerous cyst should be treated like the adamantine carcinoma. Every bit of tissue should be removed, and finally the bone cavity left behind should be subjected to chemical and thermal cauterization. Recurrence after operation on adamantine carcinoma is more serious. Yet I have recorded here a permanent cure after a second operation.

ADAMANTINE CARCINOMA

I have covered this type sufficiently in the beginning of this article. I warn again of the danger of draining an apparently single benign cyst in an adamantine carcinoma.

SOLID FIBROMATOUS TUMORS

Solid fibromatous tumors are not so

common as the dentigerous cysts and adamantine carcinomas. It is difficult to tell whether they are primarily central in which the bone shell is later destroyed by pressure, or primarily periosteal, in which, later, a bone shell forms from the capsule. They occur in the lower jaw and in the antrum and often reach great size. As a rule, they are microscopically sarcoma, and many patients die of recurrence and now and then of metastasis. I have described all I have seen.[8] When these cases are followed, the ultimate results are distinctly different from those in definite malignant cellular sarcoma. These patients are all dead irrespective of the duration, size of the tumor or completeness of eradication; while, on the other hand, in these cases of fibromatous and fibromyxomatous tumor, whether very cellular and therefore called sarcoma, the patients are living. The first cures were accomplished by radical resection, which uniformly failed in the more malignant tumors sarcoma and carcinoma. I then found reports of cures after irradiation and the use of Coley's serum. Cases of this kind were registered with Codman in his first call for five-year cures of sarcoma of bone. Then I began to observe early cases and accomplished cures with less radical operation with the cautery.[9] As stated many times in this article, one will not be able to distinguish roentgenographically these tumors in either the upper or the lower jaw.

No matter how fibrous they look in the gross, or how much like a fibroma in the frozen section, I would advise against shelling out or enucleation, unless the shell of bone left behind is treated with chemical and thermal cauterization. I have reported cases that have recurred after operation with the knife with enucleation and shelling out, and although the recurrences have been ultimately cured, the patients have been severely mutilated.

THE GIANT-CELL TUMOR

The giant-cell tumor is now best described, with references to the literature, in the book on bone tumors by Geschickter and Copeland, published by the *American Journal of Cancer*. I have completed my notes[2] up to July, 1929. In the past three years, I know that none of our cases treated with thermal and chemical cauterization in addition to curetting have recurred, and some new cases have been added to the old cases. Tumors are being recognized earlier, and the tumors are smaller. In one case in which the roentgen-ray film suggested a third recurrence, the patient has remained well for five years after being treated with radium. This case was fully reported.[2]

Apparently, the more malignant tumors of the lower jaw do not appear as frank central tumors which, in the beginning, have an intact bone shell and are more commonly situated in that portion of the lower jaw in which teeth are present. The presence of a nonerupted tooth does not seem to be diagnostic. When these tumors are very small, and even when they are very large, there is no way in the roentgenogram or clinically to make a differential diagnosis, but the picture is not typical of a root abscess. It is a great mistake to extract the teeth when one or more are loose, even when there is a toothache or tenderness. I believe the most modern conservative treatment should be preliminary irradiation with deep roentgen rays, unless you have in your locality a well trained radiotherapeu-

8. Footnotes 2 and 4.

9. Bloodgood, J. C.: South, M. J., 12:248 (May) 1919.

tist and sufficient radium. Then, if the cyst does not heal or ossify, we should explore it. It makes no difference whether the incision is within the mouth or outside it, if we are not fortunate enough to have present a pathologist who can make and interpret frozen sections, it is wiser to thoroughly curet the cyst of every particle of soft tissue and remove every tooth whose root is exposed, and then cauterize with the chemical and thermal cautery as already described here, pack the cavity and let it heal by granulation, and then submit the tissue to a pathologist. Every dentist, whether an oral surgeon or not, must be on the look-out for these central tumors of the lower jaw which are not dental-root abscesses. We need more accurate observatons on the smaller tumors and the results of treatment of the smaller tumors. We have more than enough observations on the larger tumors. Our recorded knowledge in the text books is sufficient to instruct anyone who will read how to attack these larger tumors. But there is little in the literature on the smaller tumors. Except for a few cases observed in the past three years, every example of a smaller central tumor of the lower jaw has been reported.[2]

Figure 1 is a high power photomicrograph of a section from a small granuloma attached to the root of a tooth, extracted because the roentgenogram showed a small dental-root cyst. The patient complained of no pain nor tenderness in the tooth, but pain and tenderness of two weeks' duration in the elbow. The picture shows granulation tissue with many polymorphous leukocytes. This is the typical picture of a granuloma, or the so-called dental-root abscess. When this section was given out to a number of pathologists, a minority diagnosed it as lymphosarcoma. This picture and the atypical downward growth of gum epithelium which is often attached to extracted teeth, especially when there is much pyorrhea and receding gum, should be familiar to every dental pathologist.

Figure 2 is a section showing the lining of a bone cavity the size of a 10-cent piece about the roots of two incisors of the upper jaw. There is a definite epithelial lining. In this case, the condition was diagnosed "gum boil" and treated by incision. The sinus healed when the connecive-tissue lining of the bone cyst was removed. This is either a small dentigerous cyst or a dental-root cyst. The treatment is identical.

Figure 3 is a high-power photomicrograph of the epithelial lining of a cyst. Dr. Kegel is of the opinion that this is a dental-root cyst and not an adamantime dentigerous cyst. The patient is well since the removal of the lining of the cyst.

Figure 4 shows a small dental-root tumor which has slightly expanded two roots. No symptoms were present except local pain for some months and tenderness of the involved tooth. Diagnosis was made from the roentgen-ray film, of a possible dental-root sarcoma. Three teeth were extracted. The minute tumor proved to be a cyst with an epithelial lining identical with that in Figure 2. There has been no recurrence after ten years. This is probably a minute dental-root cyst, not a dentigerous cyst.

Figure 5 shows a central tumor of the lower jaw diagnosed as a dentigerous cyst. There was a history of extraction of three loose teeth one year before, with failure of the wound to heal. Curetting demonstrated a solid tumor; the microscope, spinocellular carcinoma.

Figure 6 shows a section of a spinocellular carcinoma arising in leukoplakia of the gum producing loosening of the teeth. Extraction of the teeth did not result in recognition of the nature of the disease.

Figure 7, a low power photomicrograph, shows a section of a typical benign giant-cell tumor. This section is from an epulis and shows the epidermal gum covering, but really pictures also a central giant-cell tumor of the jaw. A high power photomicrograph is shown in Figure 8. The giant cells of the epulis type predominate the picture, a fact which is alone evidence of benignancy.

Figure 8 is a benign giant-cell tumor, high-power photomicrograph. A spicule of bone is evident. There are but two giant cells of the epulis type. The predominant cells are spindle and round. This microscopic picture, often misinterpreted by the less experienced surgical pathologist, leads to the diagnosis of sarcoma and a mutilating operation. In this case, the small giant-cell epulis was excised with the cautery in 1918 and had not recurred in 1932 (fourteen years).

Figure 9 is a recurrent chondrosarcoma. There are typical cartilage cells present. In the periphery of the area of these cartilage cells, even with the low power microscope, the more deeply staining sarcoma cells can be observed beyond this scar tissue, with here and there small islands of sarcoma cells.

Figure 10 is a high-power photomicrograph of the sarcomatous areas in a chondrosarcoma.

Figure 11 is a low-power photomicrograph of a fibrospindle-cell tumor. Gross examination revealed a solid fibroma, a central tumor of the lower jaw. The expanded portion has a thin bone shell. Removal without resection of the jaw was carried out in 1919. There had been no recurrence in 1932 (thirteen years).

Figure 12 is a high power photomicrograph, suggesting fibrospindle-cell sarcoma rather than fibroma. Resection of the lower jaw was performed in 1925. The patient is well after seven years (1932). In this case, the jaw could have been saved.

Figure 13 is a high-power photomicrograph from a cellular sarcoma of the most malignant type. The patient died of local recurrence and metastasis, because the tumor was explored under the diagnosis of a benign lesion and its malignancy was not recognized until some time later.

Figure 14 shows a (low-power) typical chondrosarcoma. Tumors of this character should be completely resected.

Figure 15 is a high power photomicrograph of chondrosarcoma. There are still areas of typical cartilage cells of the benign chondroma.

Figure 16 is a low-power photomicrograph of round-cell sarcoma of the lymphosarcoma type, situated in the antrum. The condition was recognized in the roentgenogram in the early stage of the disease, and removed by the cautery and coagulation. The patient has been well four years (1932).

Figure 17 is a high-power photomicrograph of a malignant round-cell sarcoma of the lymphosarcoma type, our only cure so far of a tumor of this type involving the upper or lower jaw.

Figure 18 shows the typical gross appearance of the connective-tissue lining filling the bone cavity of a dentigerous cyst. In this case, the treatment was simply removal of what is seen in the photograph. There has been no recurrence after many years.

Figure 19 is a low power photomicro-

graph of a solid and cystic adamantine epithelioma. This tissue was found in a bone recess the size of a pea in a typical recurrent single dentigerous cyst of the lower jaw. It was removed with the cautery and now there has been no recurrence after six years. It is more the picture of an adamantine carcinoma than of a dentigerous cyst.

Figure 20 shows a typical adamantine carcinoma of the lower jaw. There were frequent recurrences after incomplete operations. This recurrence was the tenth and was in the scar tissue after the removal of the lower jaw.

Figure 21 shows another area of adamantine carcinoma, taken from Figure 20. The microscopic appearance of the central degenerating cells is characteristic especially of the cystic adamantine carcinoma.

PERSONAL AND PROFESSIONAL PRACTICES OF ECONOMIC VALUE

By M. C. PEARCE, D.D.S., Newark, N. J.

MANY articles are now being printed on the subject of dental economics, and organized societies are devoting many evenings to lectures and study courses on this subject. It seems that the period through which we have been passing has done more than any other in the past twenty years to make the dental practitioner (and I might add the medical practitioner also) realize that there are actually two parts to a professional practice, the first being the remuneration that his effort entitles him to, that he may meet his obligations to his wife and family, the community and himself.

I thought of presenting in outline an efficient and simplified system of book and record keeping which I developed during twenty years of general practice, but I realize that such a procedure would hardly be worth the effort. My system served me well; for you to adopt it might be folly. If the system which you use furnishes you all the knowledge and statistics that you feel necessary for the successful conduct of your business, continue its use. Otherwise have a reputable accountant set up for you a modern system whereby you may know within a few minutes' time just how you stand financially. This is paramount in importance, for many a man who has thought he was making money, and has lived up to that thought, has finally been buried by his friends.

Much has been said and written on the professional side of practice, but little on the economic value of personal practices, and practically nothing on what these personal practices should be.

Many of the things that I say will be very old to you all, in some instances forgotten long since, but to review them will, beyond doubt, stimulate thought in us all.

I will assume that your practice has fallen off considerably from the peak

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years of 1927-1929. This situation has been inevitable when we consider the predicament of the entire business world. Many of us may consider ourselves lucky that we are doing as well as we are.

Certain economists tell us that the world is gradually working out of its economic dilemma; others state with equal sincerity that we shall see an even longer period of poor business and hard times. One thing seems certain: we are going to work back to normalcy very gradually.

Owing to existing conditions, during the past three years we have all had many leisure hours on our hands. To ask what we have done in those hours in either a personal or a professional way which would better us economically would be useless; but I shall suggest some ways for use of future spare hours in waiting for the return of so-called prosperity.

To begin with, we should indulge in an honest self-analysis. Let each of us ask ourselves questions such as these, and give honest answers:

Am I keeping myself in proper physical condition through regular exercise so that my enthusiasm for work is always at par, or am I allowing my body to become sluggish?

Am I as careful of my personal appearance as I should be, or do I neglect that all important aspect of neatness and cleanliness which is so essential to a fastidious clientele?

Do I take my proper place in the community in which I live?

Do I do my share in helping solve the many community problems constantly arising?

Am I as prominently affiliated with the organized community welfare organizations as I should be, not alone as a giver, but also as a doer.

Am I doing sufficient reading of the current worth-while literature to enable me to discuss it in an intelligent manner?

Am I making any effort to broaden out mentally, or am I satisfied that my degree is evidence enough that I am a cultured gentleman?

When in public, do I create the impression that I am a successful professional gentleman, or am I getting slovenly, unkempt and careless?

Am I as careful of my conduct in these days of freedom as I was when I really cared what people would think or say?

These are very pertinent questions, and I ask you to answer them in your own mind. Some are rather elementary and need no exposition on my part. The questions of personal appearance, neatness and cleanliness are of this type, and I mention them merely to suggest that such personal items have their effect on our clientele, realizing that, with some of us, it is a failing to become a little careless along these lines.

There is absolutely no doubt that health of body promotes alertness of mind, nimbleness of limb, a zest for doing things and the sunniest disposition. There are no unhealthy optimists. There are few men standing high in their chosen fields who are physically unhealthy. It therefore behooves us to look first of all to our physical self. If I were to ask you men who give a certain fixed time of your day or week to regular exercise in an effort to keep yourself physically fit to show your hands, the result would astound us all. In our early days, we loved to play and play hard, but with increased success, we have drifted away from that essential to good health, and have become soft. Let me urge on you all the need of a regular schedule of systematic exercise. This

may be accomplished in many ways. Setting up exercises in the morning, brisk walking, horseback riding, etc., are all acceptable. I prefer to go into the gymnasium, clothed in woolens and sweat shirt, and exercise until I am dripping wet with perspiration, following this by a bath and plunge. In this way, I am reasonably certain that the accumulated toxins in my system are eliminated. Choose your own methods, but lay out some program and follow it religiously. You'll be amazed at the results obtained.

Let us consider for a few moments our position in the community in which we live. We are all of us professional men, fellow members of the medical profession, a group that is looked on as the finest, most unselfish and self-sacrificing existing, and with all of this reputation, just what are we doing outside our professional calling to make ourselves an asset to our community? Many will ask what they can do for their community. Others will claim that they cannot spare the time to enter community life. To the former, I should like to make some suggestions: Make an application for membership in one of the so-called service clubs—Rotary, Kiwanis or Lions—and after being elected, make yourself, through your enthusiastic attendance, energetic activity and actual doing of things for others an integral part of that organization. Through fraternizing with the newly made friends and meeting members of other groups through interclub meetings, acquaintanceship increases.

The community chest or welfare federation has opened a great field for those of us who see value in becoming better known. Probably this form of underwriting the current expense budgets of charitable and character building agencies is in vogue in your community, and the need for your type of man in that work is as great in your home town as it is in mine. Might I suggest that you affiliate yourself with this type of work; become a doer of the job itself, together with being a contributor. You can give more of yourself in an effort to help someone else than you could ever afford to give in money. Incidentally, the leaders in the welfare work of all communities are invariably the most influential residents, and being associated with that type of individual in a common cause is a tremendous asset.

In addition to these two suggested community activities, I would urge that you become specifically identified with one of your community's character building agencies. I would suggest either the Y.M.C.A. or the Boy Scouts. Here again, you will find a tremendous opportunity for service, activity and accomplishment, and at the same time a fraternalism with men of influence.

How can you get this suggested program started? Apply for membership in the service club under your proper classification. If there is no opening, try first one club and then another. Usually, membership classification is so flexible that room can be made for a promising member.

As for the welfare and character group, go directly to the head of the organization and state that you wish to do your share in carrying out their programs, that you want a job, and you will find that you will be accommodated. Once you have started in on an assignment, put your entire self into the project and do a really good job. It does not matter what your age or creed is: there is a place for you in these organizations. You will find that the time you spend in their behalf will pay tremendous dividends.

For the man who claims that he has

no time to do such things, I have little patience. One can always manage to find time to do what one desires to do.

There is not much doubt that we, as dentists, have had a very limited and highly specialized education. The majority of us have our high school and dental school diplomas, and there we have allowed our education to cease. I admit that we have done our share of reading of dental literature, in an effort to keep abreast of the times in our chosen field, but that is hardly to be considered as a contribution to our cultural growth or mental development in a true sense.

May I suggest that you spend your next free hour in making out a schedule for reading which will cover the remainder of this year. We have all had the desire to read certain of the classics of literature, art or the sciences. We may have had a desire to go deeper into some subject of which we have a smattering, or a real desire to know more of the great men of history. Whichever is the case, secure from the librarian in your local library, or from one of the better class of book stores in the larger cities, a list of the books on the desired subject, and pledge yourself to live up to your schedule. If followed out over a period of a year, the habit of reading will be established and its effect will be plainly noticeable to you in your public and private conversation. Reading of books, more than any other one habit, has had the greatest influence in mental and cultural development.

We all envy the individual who has developed the ability of standing on his feet and thinking audibly before an audience of his fellow men. During the past twenty years of attendance at meetings of organizations, both dental and lay, I have been consistently surprised at the relatively small number of those present who had either the nerve or the ability to stand up during the open discussion of the question at hand. All of those present were interested in, and more or less familiar with, the subject and, in most cases, had a very definite personal opinion about it, but instead of standing and giving their views and ideas to the assemblage, all, with the exception of two or three, chose to do their "discussing" after the meeting within the confines of his own limited personal group. As it is not a quality of men in general to lack nerve, we must assume that it is lack of ability to talk in public that causes this. What is the answer and what the remedy?

First of all, I would recommend enrolling in a class given over to a study of this subject—they are being given in most cities in the Y.M.C.A.'s and other organizations. If there is no such class in your community, organize a group and start one, securing a competent teacher through some educational bureau. Failing in these two suggestions, secure through your book store suitable books on the subject: "Public Speaking," "Audible Thinking" or "Thinking on Your Feet"—the title is immaterial—and absorb from the pages of those books some of the many ideas contained therein. Learn the technic and practice the art on every possible occasion. The ability to stand and give expression to your thoughts in public gatherings in your community will do much to develop your personality, your popularity and your leadership, and at the same time, broaden your conversational ability.

My final personal practice suggestion is one which most of us retire from, but which, if carried out "conservatively," is very valuable, namely, let the residents of your community know what you are doing or planning to do. If you plan to

go on a short vacation, let them in on it; if you are giving a certain period to post-graduate study, spread the news; if you are to entertain socially, don't keep it a secret. See to it that these news items reach your local paper (they will appreciate your cooperation in helping to fill their space.)

The organizations that you have affiliated with, as suggested earlier, will publicize you in proportion to the part you play in their activities, and, in this way, you will secure the publicity and personal advertising so necessary to your future economic development.

Let us now consider our problem from the purely professional angle.

During the peak years of the 1920's, when we were all swept along on the crest of a wave of optimism, built up gradually upon a foundation of ever-increasing false values, practically none of us thought that our beautiful pyramid would ever crumble. The majority of us were overwhelmed with work, very substantial, and with a goodly number of us exorbitant fees were easily obtainable—and the patient, being in approximately the same frame of mind as we, promptly paid. It was unnecessary to put forth any great effort, mental, physical or social, to either develop or maintain a successful practice. Few of us had the time or inclination to stop and analyze, nor did we fear the necessity of ever having to do so.

It is needless to remind you that today things are far different, and I frankly state that the future is assured to only those of us who are wise enough to handle our practices and clientele, in these trying times in a manner beyond reproach, giving the best possible dental care, in the most pleasant and efficient manner, with the least amount of embarrassment, and an understanding of the patient's plight, keeping in mind that the greatest task we have is to maintain the patient's goodwill.

With this thought in mind, let each of us sit down with pad and pencil and make a complete survey of our mode of practice.

Let us begin with the physical equipment that we each have and carefully check each item, beginning with the reception room and continuing on through the operating room. Are you maintaining the attractive appearance of this office, of which you were once so proud? Are you renewing and modernizing your equipment, or does it begin to assume the dingy, second-hand appearance of the man who has passed his peak? Are you as careful of the visible accumulation of dust as you once were, and do you carefully review the literature in the reception room so as to assure modern reading for those awaiting their appointed time?

To those of you who must answer these questions negatively, I should like to offer the following suggestions, for there is no time like the present in which to step right out and show the entire world that we are not down and out; that we are not defeated and that we have the utmost faith in ourselves and our future. Let us clean house and do a thorough job; make plans to redecorate and repaint the entire office; throw into the discard that dilapidated reception room furniture, and the frayed floor covering, and subscribe to new and modern magazines. Let us make a deal with our supply house for the replacement of that old, long used and much loved equipment, not with other used or second-hand pieces but new ones, of the make and color you always longed to possess. Some may say, "This is all very fine, but what will I use for money?" It is true that to those men this will be a program

involving real hardship, but your dealers are more hungry for business today than ever before, and you'll be surprised what little money you need and what easy terms you will receive. All that is needed to put you back even with or ahead of that other man who, to you, seems to have all the breaks is a little good sense on your part.

To those who are satisfied with their office equipment all I would say is "Do not remain so." Make it an ironbound rule to make some noticeable change in your surroundings every year. It keeps your patients talking about you, and that is good business.

The second most important factor in our offices is the secretary, or office assistant, and I wonder if she is of that spoiled type who has been allowed to think that you could not practice without her; that she is the pivotal point, in your office, around which everything revolves; and who, with such assurance of permanency, has become domineering and overbearing in her relations with those who seek your services. If she is, get rid of her, and quickly, for she is in the same class as that old equipment, antiquated, and more harmful than helpful. It may be difficult to take this action, but you must keep in mind that we are discussing economics, and a secretary of this type is a poor investment. One of the secretary's chief duties is making contacts with patients, both directly and over the telephone. If she is the proper type, we need not worry over her direct contacts; but in telephone conversation, she may easily be misunderstood. Therefore, I suggest that you have a direct part in this phase of her work, even to the extent of composing replies to questions which are most commonly asked by prospective patients relative to appointments: fees, telephone diagnosis and advice for treatment. In this way, you will be sure that no misstatements are made.

Let us now consider all of the printed matter in use, professional cards, reference acknowledgments, letterheads, both business and personal, bill heads, appointment cards, the notices sent to patients regarding periodic examinations and prophylaxis, and all other printed forms that we may have. The original orders for these were probably given at different times and possibly are composed of as many different types of printing. If this is so, I urge you to discard the remaining stock, secure from your printer a style of type which is distinctive and have all printing uniform. This gives an appearance of orderliness which is noticeable to the fastidious individual.

I have a fair idea as to the general makeup of the average dentist's bookkeeping system. In most cases, it consists of a patient's work slip, a cashbook, bank passbook and checkbook. There is absolutely no way of securing a service analysis telling how many inlays have been made during a given period, how much it cost to produce them or how much profit was derived therefrom. The same is true of all other services rendered. Such a system gives no information as to which services are remunerative and which are definite expenses. If yours is of this type, I suggest that you secure the services of the best C. P. A. available in your community and have him set your books up correctly.

Upon completion of the survey of our physical equipment and making the notations of necessary and desired changes, our next step should be to put ouselves to the acid test of self-analysis, first, in respect to our handling of patients, secondly, in the performance of our service to those patients and, thirdly, in

securing from them the necessary remuneration.

In the early days of our practice, we are all of us most careful of our professional attitude in dealing with those seeking our advice and council. As years go on, and the enthusiasm for the game wears away, many of us are apt to look on those same people as a necessary evil, forgetting that they play an all important part in continued success. We become domineering, sharp and abrupt. We forget that the patient is the one spending the money for service and is entitled to ask questions. We sometimes feel that our suggested method of repair or replacement is the *only* way, and that it must be done *my* way, or not at all. Some may even feel that they are superior to all others in ability and judgment, and, in so acting, offend the more humble of their clients.

With these thoughts in mind, I suggest that your analysis of self be just a little critical. Remember that there is such a thing as art or science in handling people. Perchance you are one of those gifted with the ability to handle all sorts of people graciously and properly, bending them to your will without undue force. If so, you are indeed fortunate. If you are of the great majority, I urge you to do some constructive reading on the subject of handling people. There are many excellent books on the subject, and I once again refer you to your bookstore.

In all of my experience in dentistry, I have found but one man who admitted that he was a poor dentist, and this man attended more dental meetings, read more dental literature and took more postgraduate courses than any other two that I have ever known, and when I met this man, he was beyond doubt one of the best dentists in the metropolitan district.

Most of us feel that we are excellent dentists: we have not taken the time to honestly analyze our efforts, finding wherein we are weak, or along what lines we could put forth a little more effort in order to improve. As long as we know that we are good, and are satisfied with our efforts, why take time or go to the expense of any further study? We may get along for some time, but sooner or later we will begin to lose ground. Dentistry is progressing; it is drawing closer and closer to medicine; it is constantly spreading out and going forward, and if we are satisfied with our present knowledge and ability, we are standing still. No matter how good we really are, standing still means stagnation, and stagnation in any line of effort means retrogression.

Therefore, I urge you to take advantage of the many excellent programs offered, not only by your own local and state societies, but also at meetings in neighboring states. In addition to this, find when and where the next meeting of one of the Midwest state societies will be held: Michigan, Illinois or Minnesota, and make plans to attend. There will be some expense attached, but the benefits derived will far outweigh that item.

Postgraduate instruction should be a part of every practitioner's winter program. Practically all societies give a series of winter study courses, taking from two to ten evenings a season. If such is not the case with your organization, approach some fellow practitioner who has something to offer you. Tell him that you wish instruction and are willing to remunerate him for his time. You could even seek the instruction of the medical profession on such subjects as physical diagnosis, auxiliary sinuses of

the head and infections of the head and neck or, even with profit, you might once again dissect the head and neck.

These suggestions deal with the preparation of self and will affect, in the main, the performance of service, through diligence in keeping well posted on the newer ideas, technics and methods developed along the trail of dental progress.

In talking with many dentists who come into our office, I find that the difficulty in securing payments for services is quite general. I hope that this is not true of you; but whether it is or not, we should give consideration to this subject and there are a few suggestions to be made: 1. After studying the particular case at hand, no matter what type of work is required, give the patient an exact estimate for successful completion. 2. Have a frank, courteous, friendly discussion on how this fee is to be paid.

I readily admit that I have a distaste for mentioning fees to a patient, and so have many of you, but the present day conditions have made me see the picture from the viewpoint of the patient, and it is my honest opinion that, with all new patients, and the majority of old ones, we should, before proceeding with any service for which we are to receive a sizable fee, see to it that the patient has, in some way, been informed of the expense involved. The pleasant and diplomatic way to do this is to drop a leading remark, after carefully reviewing the case and explaining existing conditions such as, "Mrs. Jones, this work will involve considerable expense," which will naturally bring out the question as to how much we expect to charge. If this fails, a frank statement should be made and the patient given the opportunity of accepting or rejecting our services. Having agreed to the amount stated, the question as to how it will be paid should be settled. The entire subject is easily opened for discussion and agreement in this way. The question of money matters has always been a source of embarrassment in the family circle, and I feel it will always be in your practice and in mine. If this is so, the embarrassment must be assumed by the operator and the patient spared. Your secretary, no matter how clever, cannot handle this graciously. I have yet to meet the patient who was embarrassed, insulted or hurt because he or she knew what my services would cost before accepting them, while the numbers who have experienced these feelings by being presented with a sizable statement without hint or warning are many. I do not feel that any of us are so important that we can afford to place one of our clients in that position.

Naturally few of us are receiving the fees that we did at the peak. We cannot expect to maintain our level of fees with the paying ability of the entire country far below par. We should therefore, more than ever before, make an effort to charge fees which are commensurate with the individual's present ability to meet obligations, and be as lenient as possible regarding the terms demanded. These are times to protect and maintain the good will of our clientele. Fair dealing now means insurance for the future.

Many dentists are making use of one of the professional credit companies, organized rather recently to secure payment of professional accounts. Practically all of the plans are similar. The patient makes application for the amount desired to meet the anticipated bill, agreeing to make monthly payments, usually ten in number, paying a bonus of $5 per hundred borrowed. On acceptance of the account by the company,

the dentist receives 50 per cent of the amount in cash, the company keeping 10 per cent as service charge. The remaining 40 per cent is paid on completion of the contract. By this means, the patient secures the necessary dental care; the dentist his money less 10 per cent (and who would not gladly do business today on that basis?), and the company takes the risk, does the collecting and makes a profit.

This plan is presented merely as a suggestion, applicable in certain types of cases. Your judgment must be your guide in its use.

I am convinced that the taking of a complete history of every patient is an essential part of our practice. This should include medical references and systemic involvements. You should know whether there is any heart, kidney or vascular disturbance; whether the patient is undergoing gastric discomfort or there is evidence of the early stages of any of the rheumatic diatheses.

Such a program has a most beneficial psychologic effect on the great majority. Your thoroughness is impressive and the patient relates her experiences to her friends.

As we all know, the earliest symptoms of many systemic diseases occur in the oral cavity, and through our recognition thereof by means of this history taking, we may often avert acute illness. If this should happen, a communication to the patient's physician informing him of your findings is in order.

This brings to mind another most beneficial practice. While in general practice, I secured from every patient, on the first appointment, the name of the family physician, and on completion of the physical, dental and roentgenographic examination, I advised him of my findings, explained the existing dental conditions and subgingival lesions and suggested possible systemic treatment. The reaction of such practice will amaze you. The psychologic effect is excellent, and you will soon be looked on by the physicians of your community as most thorough and competent; all of which will invariably lead to the referring of patients to you.

Patients reach our offices through many channels, the majority through direct recommendation. Let us therefore make it a point to establish definitely just how each new patient came to choose us, and when it is through the personal recommendation of some friend, patient, former patient, physician or mere acquaintance, be courteous enough to write a personal letter of thanks and appreciation. Do not use a printed form. That is poor taste. This practice is just one more little effort that will have worthwhile results.

CONCLUSION

Conditions are admittedly hard. The bottom has apparently fallen out of things. People are not inclined to invest in the extensive dental restorations from which we receive our greatest remuneration. Many are not having the necessary filling work done. Some of us can do all the work we desire but do not receive payment. The great majority have plenty of time on their hands. However, the end is not here. Our entire economic structure is not going to destruction. As the saying goes, "In times of peace, prepare for war." It will not be long before the American people and the entire world will again be flourishing. The part we will play in our chosen field at that time will depend largely upon what we are doing during the present period, to better prepare ourselves to meet the demands which will be made on us. Let us enlarge our program, both personal

and professional, making new and broader contacts, giving of our efforts unselfishly, and working, as in our early, presuccess days, for the better preparation of self.

516 Broad Street.

DENTISTRY, PAST, PRESENT AND FUTURE*

By C. N. JOHNSON, L.D.S., D.D.S., Chicago, Ill.

IT is surely a very large order to write at all comprehensively of a subject as wide as the one implied in the title "Dentistry, Past, Present and Future." Manifestly, the most that can be done is to skim over the subject, throwing a few high lights here and there, and begging the reader to exercise his prerogative and fill in the picture as best suits his fancy.

To go far into antiquity is not the purpose of this presentation, nor can we indulge in much detail. Dentistry was practiced in a crude way before the Christian Era, and books were written on the subject. The first man to practice dentistry, or to be known as a dentist, was Cascellus in 80 A. D., but medical books were written before that in which there were chapters on dentistry. We owe much to the French in the early development of dentistry. In fact, Pierre Fauchard, who was born in Brittany about 1678, became the father of dentistry, and in 1728 he published in Paris a book under the title, "The Surgeon-Dentist—or Treatise on the Teeth." In this book was embodied most of the then known dental science and literature of the day, and it did much to establish dentistry as a real profession.

Just a century ago, Joseph Fox of England published a rather pretentious volume of nearly 200 pages with many illustrations, some of which would do credit to engravers of today. The title of this book is "The Natural History and Diseases of the Human Teeth," and it is very interesting reading. Through the kindness of Dr. George J. Goldie, of London, England, it has been my privilege to possess a copy of the third edition of this book, dated 1833, and I cherish it as one of the great prizes of my library.

Shortly after the appearance of the book by Fox, another development of great importance occurred in dentistry. In all the annals of human suffering and of beneficent relief, nothing has ever approached in significance the discovery of anesthesia. Much controversy has raged about the names of the men for whom priority of discovery has been claimed, but at least this much must be said, that it was undoubtedly a dentist who introduced anesthesia to the world. We are not concerned at this time with the choice between Wells and Morton since both were dentists, but in popular repute the thing that seems to stand out with the most definite demonstration is the administration of nitrous oxide gas for the extraction of a tooth by Wells in 1844. At least, dentistry should have the credit for the introduction of anesthesia.

In a general survey of the development of dentistry in the past, the high light of achievement must be designated

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as the science and art of successfully saving the natural teeth when they have been attacked by decay. Whatever may be said of the genius that invented the artificial tooth, and the blessing that came from its mechanical perfection, there has never been evolved a denture from the hands of the most expert prosthodontist that could compare with a set of natural teeth well preserved. This is so generally recognized that argument is unnecessary, and it may therefore be well to consider some of the agencies through which, during the past century, the leading members of the profession have sought to perfect the means of preserving the natural organs.

I think it must be acknowledged that with all the advances in the way of diet, and all the prophylactic measures that have been suggested or attempted, the sheet anchor of our success in the past has been the methods of filling cavities and the resultant checking of decay as soon as it has begun. We assuredly have not yet achieved the great boon of prevention because we know only too well that cavities continue to appear, and until and unless this is brought about, we shall have need, as we always have in the past, of devising the best means of filling teeth. Speaking of the past, let us consider as a matter of history what filling material has proved the most reliable through all the years. Intrinsically and clinically, I think we must acknowledge that gold embodies in its physical properties more of the desirable qualities than any other. At least, it can be claimed that, in America in particular, gold foil gave an established status to the science and art of filling teeth, and created more confidence among the people in the efficacy of saving teeth than was ever achieved through any other medium. No reflection is hereby intended on the other materials used for filling teeth, all of which have served a certain purpose quite acceptably; but gold must ever remain the standard till such time as the genius of man shall devise a material of greater excellence. When the inlay displaced in appreciable measure the malleted filling, we still had gold with its desirable qualities, and thus this material either in the form of foil or in inlays has constituted a very appreciable element in our filling armamentarium.

And may it here be stated that a material which has stood the test for such an extended period must be accounted worthy of much consideration. It may be doubted that the rank and file of our profession realize the length of service that has been given by gold for filling teeth. I had always supposed that the fifteenth century witnessed the introduction of gold foil for this purpose. It had been stated that Giovanni d'Arcola of Padua was the first to use gold leaf for filling teeth, in 1450, but the claim was later made that the Arabs had used gold for this purpose as early as the latter part of the eighth century. In fact, it may be doubted that the exact data regarding discovery of foil for filling teeth have ever been definitely established; which means that it must have been in a period of great antiquity. Had this metal not possessed the virtue of intrinsic merit, it surely would never have been accepted for all these centuries, and so the unstinted encomiums that have from time to time been meted out to it are most justifiably bestowed.

To come down to the immediate past, or what we might with almost equal propriety term the present, we have, in 1907, the introduction of the cast gold inlay by William H. Taggart of Chicago, which has proved one of the most outstanding discoveries of the age in dental science. Inlays had of course been made by the matrix method, but the real impetus to the insertion of gold inlays followed the

introduction of the cast method. It would be difficult to estimate the effect of this method on the practice of dentistry, but it is safe to say that, as a utilitarian development, it ranks as one of the great achievements of dental progress.

It was not only in the field of inlays that the cast method proved its serviceability, but also in prosthetic substitutes of all kinds, from bridges to partial and full dentures. The technical ability of the present age is unquestioned, and if our physiologic, histologic and pathologic acumen were only as perfectly developed as our manipulative skill, there could be no question of our high standing as a profession. And this brings us to a direct consideration of our present status.

To properly evaluate the present day tendencies in dentistry is a rather intricate task. Never before in our history has the profession been confronted with a greater variety of problems than those that are facing it today, yet I am constrained to believe that the situation is not so serious as some of our alarmists would have us believe. In common with the rest of the world, there has been a sad warping of our ideas on several counts. We have seen an undoubted diminution of our material resources, and, in some instances, a rather disastrous slump in our economic reserves. This slump has caused in the minds of many a very grave concern as to our future, a concern which may seem natural in view of the debacle that has accompanied so many of our enterprises in the recent past; but there are only two circumstances in which the present situation is one whit different from the many previous depressions that have followed our history from the time history was written. Today, there are more countries involved in the economic stress, simply because there are greater facilities for transportation between countries than ever before, and because there is not now and never again will be the comparative isolation that we have seen in certain countries in the past—our own for example. For good or for ill, the countries of the world are closer knit in a community of interest than heretofore, and, by the same token, the tension consequent on a clash of those interests is likely in the future to be more severe and more dangerous. In other words, the different nations and the different individuals in the nations must more unceasingly strive to maintain a better understanding among the peoples of the earth to the end that the glib war talk that enters into the chatter of so many people today shall be winnowed from our literature.

This is not a sociologic dissertation on world affairs, but it behooves every intelligent man—among whom we venture to hope that we may find at least a few dentists—to think seriously on matters of the greatest moment to all of us. Indifference to existing conditions among otherwise educated men is one of the evils of our common humanity, and there never was a time when sane thinking was more essential than it is today.

As to our own immediate problems in dentistry, aside from the prevalent economic stress, there is nothing sufficiently alarming to give cause for great concern if we but hold our ship on an even keel and maintain balance in our mental processes. The profession has been charged of late with a negative policy toward the public as far as our economic problems are concerned. We have been told that unless we do something about it, something will be done for us, or to us. Well, let us see. In all of the utopian plans that have been suggested, I have seen not one concrete suggestion which, if carried out, would benefit either the public or the profession. We cannot get away from the fundamental policies of equity and justice to all men without placing in jeop-

ardy the welfare of the community, and, in professional life, we cannot foster the policy of mass production and render the most acceptable service either to the rich or to the poor. Dental service cannot be turned out by machinery. You cannot heat a ladle full of filling material in a furnace and pour out a dozen molds in the cavities of teeth. Filling teeth is an individual service and always will be. Even in dental research, a community of sentiment or a consensus of opinion has seldom netted any fruitful result. It is true that, by communing together, the minds of men may expand. The ideas of one man may prove an incentive to other men, and one man's mind may be projected into the mind of another. It is through this medium that dental societies are of such value to their members, but, after all, real progress comes mostly through individual initiative. Look down through the ages ever since dentistry was recorded, and the names of certain men stand out as definite mileposts in dental progress. Emerson said: "An institution is the lengthened shadow of one man," and in dentistry we can almost designate by name the men who have contributed in an outstanding way to the different steps in our professional development.

Some time ago, I was sitting in conference with a committee where the problem of taking care of the people of the poor was being discussed. One member of the committee outlined a plan whereby operators were to be placed in a row side by side in a clinic and patients were to be cared for in the following way: A patient was to be placed in chair No. 1, and a cavity was to be prepared for a filling, or probably several cavities were to be prepared, and the patient passed along to chair No. 2 to have the fillings inserted. At each step of the operation, the patient was to go to another chair and receive a given service, and this was to continue till the operation was completed. Essentially, the plan was to put the patient through a machine-like procedure and turn out dental work by mass production. The argument for this was based on the fact that in doing nothing but preparing cavities, for instance, the operator would become more expert in this kind of work and thus speed up the entire operation, or, as one of the men said, deliver dental service through the medium of what in the industries would be called "shop practice."

This idea was so foreign to all the traditions of what I had conceived to be a legitimate procedure in the practice of dentistry that I questioned the plan most vigorously, only to discover that I stood alone in my objection. But this was not the crowning blow. When I had raised the query as to the possible stultifying effect of such a practice on the development of professional spirit and community of sentiment between patient and operator, I was blandly told that there was no object in cultivating such a sentiment. Shades of the dental immortals!! If this be the policy and theory of the present day, we may well exclaim, "How are the mighty fallen!!" Such at least were not the ideas of the stalwarts in our profession who devoted their best energies so assiduously and be it said so successfully, to the upbuilding of our profession, and who established a stable basis for dentistry to rest on.

But I am not willing to admit that the saner thought of the profession will ever countenance such a perverted conception of dental practice as this, and I am inclined to account for such ideas on the ground that the recent economic and social unrest to which we have been subjected in recent times has warped the point of view and clouded the vision of some of our men till they have lost their mental balance and have been swept en-

tirely away from their legitimate moorings. Surely dentistry has something better than this to offer even in our humbler efforts to minister unto the poor. If this kind of group effort ever became prevalent, it would at once spell the doom of professional progress. It would not only destroy the ideals of the ethical concepts that have been built up in the past, but would result most disastrously for the welfare of the people of the present. Proper service could never be administered by such a plan, and the thing we call the professional ideal would vanish from our consciousness.

Whatever may be said of the plans for taking adequate care of the people, and however insistent may be the need for such care, at least we can say with confidence that anything as revolutionary as some of the plans advanced in recent times will never work out in a practical way, nor will they ultimately appeal to the people at large.

No one wishes for an instant to ignore the needs of the common people, the bone and sinew of our commonwealth, many of whom today have been subjected to the trials of economic stress and some of whom have been well nigh demoralized thereby; and surely it has never been the tendency in this country to spurn the very poor in our midst or to refuse to lend them succor in time of need. Ours is not essentially a heartless people as has been amply proved in every instance of disaster or public calamity. Spontaneously, the hearts of our citizens have responded to every appeal of a community need, and there has always been the impulse to help the helpless. This has been one of the most heartening experiences of our social life, and it is proof positive of the essential goodness and charity of our citizens. It is true that we have not always dispensed our charity with wisdom, and as I look at the net results of our efforts in this respect after a somewhat extended observation, I am more and more impressed with the fact that we have erred through unwise generosity oftener than through the withholding of needed succor. In other words, we have not sufficiently discriminated in our charitable efforts, and have thereby, unwittingly, in many instances done more harm than good.

Say what we will, there is always a grave danger in dispensing aid to others, owing to the demonstrated fact that it has a demoralizing effect on the recipients. This relates not, of course, to dependent children or to the aged or helpless, but with these exceptions the line should be closely drawn. I have often remarked, and it cannot be reiterated too frequently, that the moment an able-bodied man reaches out his hand and accepts something for nothing, that moment there begins in that man a moral disintegration that does him a definite harm. There is nothing that so surely saps the manhood of an individual as this, and one of the great injuries that have resulted from the generous attempts to dispense relief during the recent economic stress has come through this demoralization of able-bodied men. In spite of all the laudable efforts to exclude the unworthy from seeking relief, it is only too well known that, in our large cities, where millions of dollars have been raised for charitable purposes, altogether too much of this money has gone to the pockets of men who were unworthy of aid, and who would not work even if work were offered to them. We see eloquent evidence of this kind of demoralization on the streets of all of our cities in the hordes of beggars of every nondescript type that infest the walks and highways of respectable citizens everywhere.

I make the emphatic assertion here that if I were mayor of a city, I would run every beggar off the streets at once, and

then I would establish civic enterprises and improvements that would keep every able-bodied man employed and give him an opportunity to work and earn his daily bread. But work he would have to, or he would not eat. It would be far cheaper than to sustain a lot of leeches that prey on the people, and offend the sensibilities of honest citizens as they go on their legitimate business in our public thoroughfares.

Of course, with our present limited financial resources, the wages of these civic enterprises would necessarily not be high. There would be no union scale, and if the labor unions began to object, they would be told in no uncertain terms that the present urgent necessities of the people meant more than the arbitrary rules of the union. If they persisted in trying to force high wages on an unwilling public in an emergency like this, they would be fought to a finish, and that would mean *fight to a finish*. Law and order would be maintained at whatever cost necessary, and every man would be given a chance to earn an honest living without interference or intimidation.

The abuses of labor are no whit more commendable than the abuses of capital. Each in the past has sinned grievously, and each should be brought to book, but in all the lamentations over the poor working man, a warped point of view has developed which sees nothing good in capital and nothing bad in labor. But let it be stated in the same breath that the average working man is not by any means as bad as are the labor bosses who lord it over the rank and file of labor, and who lose no opportunity to besmirch the name of capital. These men flaunt the principles of decent citizenship, and blink at bombing and coercion as if they were legitimate weapons wielded in a just cause.

The lawlessness of the past few years in the name of labor is a disgrace to civilization, and the sooner the honest laboring man rises in his might and weeds out the pernicious element in his own group, the better it will be for everybody—for society at large and particularly for the laboring man himself. Driving out the money changers from the temple was a mild procedure compared with what is needed today in the elimination of the vicious practices of the present; and when we speak of vicious practices, we do not by any means exclude from the category the flagrant wrongs that have been meted out by some of the bank magnates of the recent past. The scandals among some of our bankers smell to high heaven, and there should be no quarter given to them any more than to the racketeers who bomb and shoot. Crime is crime in whatever guise it may be presented, and if we are to have an observance of law and order, we must hold every man accountable for the "deeds done in the body," and not blink at injustice merely because the criminal chances to be a lily-handed son of the so-called upper class.

I have in my heart of hearts an abounding faith in the ultimate good of my fellowman. Sometimes that faith has been terribly strained, as in the case of certain developments of the recent past where the forces of evil have apparently gained such a dangerous ascendancy. Not attempting to catalog the half of them, we have only to recall the injustice and the appalling effrontery of the racketeering methods that have menaced our citizens, and left in their wake such a hideous record of misery; and the scarcely less pernicious practices of the men "higher up" to which I have just alluded. But granting all of this, there is in humanity such a solid core of essential goodness and such a genuine will to do the right thing that I am abundantly optimistic as to the future, and immeasurably confident of the

ultimate triumph of good over evil impulses.

And this leads me, after all my wanderings in the realm of the broader and more urgent socialistic problems of the day, to a consideration of the future of our own profession. Nowhere in human endeavor has there ever been a more laudable or praiseworthy enterprise than that expressed in the development of dentistry. In a little less than 100 years of organized effort, we have developed a science and art in our calling that commands the respect and even the admiration of the world. We are in no wise vainglorious, realizing only too well, as we must, our manifest limitations, and conscious only of the fact that we have more to learn than we have ever known, but with our faces turned toward the light, we may at least confidently claim that we are well on our way.

The future has so many possibilities for us that it may be permissible to consider some of them very briefly. The development of dental art must go on as it has in the past to a greater and still greater perfection. We have prided ourselves, and justly so, on the excellence of our technical procedures, but even these are amenable to great improvement. And, in the science of dentistry, we must frankly acknowledge the need of an almost revolutionary reform in certain fundamentals. To do this, we must turn our eyes resolutely toward research. We do not yet know all of the agencies involved in the cause of dental caries, nor are we fully informed on the etiology of the affection called pyorrhea. Till these two diseases are conquered, at least to the extent of gaining definite information on their actual cause, we stand convicted of a certain dereliction of duty. Surely when medical science has gained an ascendancy over such scourges as smallpox, diphtheria and yellow fever, we of the dental profession must meet the challange thus implied, by gaining like ascendancy over the ailments that up to this time have been baffling us. As I see it, the future—even the very near future—must bring to us the boon of a clearer vision, and a more certain control over those diseases with which we have so long been afflicted. We cannot well control them till we have discovered the cause, and thus there is the insistent necessity for determining the cause, to the end that we may ultimately prevent them.

Laudable efforts are constantly being made toward the consummation of prevention. For years, this has been the keynote with both medicine and dentistry, and we must not halt in our efforts till it has been achieved. It is trite enough to emphasize the manifest advantage of prevention over cure, but the problem of bringing about prevention is not so easily solved. This, then, as far as the science of our profession is concerned, is the highest hurdle over which we are compelled to pass in our race for the ultimate goal, and it is the one problem that faces us in the not distant future.

Probably today the most insistent need of the immediate hour is found in the approach to our economic and social problems. This at least is uppermost in our minds when we think of the situation that confronts us, and no one needs to urge that there is a great chasm between the service that we are rendering the people and the appalling need for service that we see manifest everywhere. It is a recognition of this fact that has led some of our profession to make suggestions as to a possible remedy, and this is a laudable impulse on the part of those who make these suggestions.

Yet we cannot but think that some of the suggestions recently made are not conducive to an effective remedy. Let us grant to every man the courtesy of listen-

ing to an expression of his ideas on any subject of concern to the profession or the people, even though we may not find it in our logic to agree with him. Most of us are too prone to intolerance when we are wrought up over any question that profoundly affects us, and some of us do not scruple to make misrepresentations in the attempt to advance our ideas. It may be only a natural manifestation of human nature that impels men to do this, but it is assuredly subversive of the best interests of everyone for men to succumb to this tendency and it is not in strict accord with the scientific habit of thought that should animate professional men.

In the recent economic *impasse* that has confronted us, various remedies have been suggested for the relief of a stricken humanity. In dentistry, we have seen the anomaly of literally thousands of our fellowmen suffering from the ravages of dental disease without apparently the means for instituting the necessary measures of relief. This is always distressing to people of high sensibilities, and I would have it known that the members of our profession are not unmindful of the conditions that have been confronting us. At least, we cannot be charged with a callous lack of consideration or with a failure to appreciate our just obligation in the situation, as some of our writers would intimate. I venture to think that, with most of us in the profession, there is an honest desire to do all in our power to bring about a remedy for our ills, and to institute measures of relief for every needy individual among our citizens. The only difference that I can discern is in the measures that are suggested for solving our problems, and in this there seems to be something of a chasm between the opinions of one group and those of another.

One group in our profession would seek to solve the problem through socialistic measures, or, in other words, through mass production. They advocate essentially what one of their number has just designated as "shop practice," putting patients through a mill, and turning them out as finished products by machine methods. Not only that, but they would have the policies of professional practice directed by the state, some of them going even so far as to advocate state control and state aid through the medium of taxation; as if excessive taxation had not already become a sufficient byword in the land, and as if our citizens were not on the verge of virtual rebellion against the exactions of our taxing bodies. Not only this, but can any one imagine that professional service could ever be directed through the agency of state control, or administered in any way by political appointees? In recent years, the state has not given evidence of sufficient acumen in the conduct of its social affairs to be entrusted with the policies of the professions.

When objection is made to state interference with professional service, it should be noted that no reference is had to these isolated conditions in pioneer regions where little regular professional service is available, and where the people are sorely in need of such service. Any agency should be used that will relieve the emergency and bring about an amelioration of the sufferings of the people, but this has no reference to ordinary conditions of life where dentists are readily available.

We are told that we need a new deal in dentistry, that the policies of professional practice in the past are no longer workable and that we must advance with the times. No one can argue that there is not need of progress, nor can we contend that our present methods are 100 per ent effective. Nothing in human endeavor is ever 100 per cent, but when the policies and principles laid down by the builders of dentistry are swept aside as of no avail, and when the new deal consists of advo-

cating mass production in dental service, we may at least be pardoned for wanting to hold fast to the good in dentistry till it has been demonstrated that the new deal as represented by the socialistic trends in dentistry can ever work out for the best interest of either the profession or the people.

Were it not for the great length of this paper, I should like to outline in some detail what I conceive to be the best approach to the problem of caring for the teeth of the people who are under financial stress. At least, I may say with some assurance that the problem can never be met by doing an inferior class of service, nor by fostering the idea among the people that they are entitled to indiscriminate charity. No dentist of any heart will ever hesitate to relieve pain regardless of remuneration—it has become one of the tenets of our professional faith—but neither should a dentist encourage the idea among the people that they are entitled to free dental service for life just because the stress of economic necessity has made them temporarily dependent. In our laudable impulses of the past, we have sometimes created a false philosophy of succor of our fellowmen. We have sought to improve conditions among the people by lending them what has seemed to us necessary aid, and we have ended by breaking down their moral stamina and contributing to pauperism.

To foster the idea of expecting something for nothing is demoralizing to every one, most of all to the ones who are the recipients of the bounty, and until we do our share in compelling people to realize that sacrifice of some kind must accompany every attempt at succor, we shall not go very far on the road to equity and responsibility.

The future of our profession demands that we shall not only lend legitimate aid in any emergency of calamity or suffering, but that we shall also have the discrimination to learn that the most effective way to help people is to teach them to help themselves.

All of this may sound vague and impractical as a means of solving the problems of the hour, but it is no whit more impractical or unworkable than the idea of socialized dentistry, and the latter may prove much more disastrous. May I suggest briefly my idea of the proper approach to this problem? In addition to all of the agencies in operation in the past and those still existent, such as philanthropic clinics, and dental welfare work for children, the Forsyths, the Eastmans, the Rosenwalds, the Guggenheims, the Samuels, the Carters, etc., let the individual dentists all over the land devote their best energies toward the alleviation of dental suffering everywhere. Let each practitioner in his own office do his full share in a sympathetic and cooperative way to delivering needed dental service at a fee that the people of moderate means can pay, and thus prove that the profession is always willing to meet the people half way in any emergency of their lives.

After all, the problem must be met by cooperation between the people and the profession, and not by any agency controlled through state domination or political influence. Our profession has been built to the splendid structure that it has attained today through the agency of professional endeavor directed by men of vision in our own ranks, and not in the least by state control or even by state suggestion. Shall we place in jeopardy the ideals that have been mostly instrumental in making our profession what it is, by attempting to introduce into our policies mass production and machine methods with a calling that in the very nature of things can never be made to function successfully through such agencies? Rather shall we not so direct our energies that

we shall further perfect the well tried policies that have stood us in such good stead in the past, and through which we have been permitted to serve humanity so acceptably.

Let me ask these questions: Is dentistry the only enterprise of life that has suffered during the recent economic stress? Has medical service been better administered than dental service? Have people worn as good clothing as they did? Have they built better homes? Have they cultivated the arts as they wanted to? Has culture of any kind advanced as it might? Have we lived the fullest life of which humanity is capable?

It is not quite fair to heap the onus of inefficiency on dentists or dentistry alone just because the times have been sadly out of joint, and it is futile to rush into new schemes or new adventures seeking a panacea for our ills at the expense of the true fundamentals of life and experience. It may be meet for us to test all things, but let us not forget to hold fast to that which in the past has proved to be good.

WROUGHT CLASPS WITH PLASTIC BASES*

By M. E. NISWONGER, D.D.S., Dayton, Ohio

THIS paper will discuss the possibilities of better understanding the use of wrought wire clasps, and their attachments to plastic bases; not attempting to consider, at this time, the designing of bases and their construction. Let it be further understood that the following statements may also be applied to metal bases.

Requirements of wrought wire clasps, in design and function are: 1. Insertion should be easy. 2. When inserted, the clasp should not strain nor move the clasped tooth to the patient's discomfort. 3. After being inserted, the clasp should stay in place, and not ride up and down on the tooth during mastication, talking, etc. Nor should there be any tight, gripping action. 4. Removing the clasp should not strain or move the clasped teeth to the patient's discomfort. 5. The clasp should not be made of too rigid or too soft clasp metal. Either one spells failure. 6. The clasp should be narrow, covering as little of the tooth surface as possible, depending on bulge, not friction, for retention. 7. It should completely encircle the tooth; never less than two-thirds. This keeps the clasped tooth from being forced away from the clasp (anti-orthodontia principle).

The requirements of wrought wire clasps in bilateral cases, during mastication, are: 1. They should act as a stabilizer to the base on the side to which the force of mastication is being applied through the bolus of food, at the same time acting as an indirect retainer to the opposite side. 2. They should help in holding the base in its adaptation to tissues, when the upper or lower partial denture, as the case may be, separates from the opposing teeth while sticky food is between them; considering, of course, adaptation of the base to tissues, not the clasps, the main factor in retention for

*Read before the Ohio State Dental Society, Cleveland, December, 1932.

partial dentures. 3. Since, in partial cases, the tendency is for food to creep between base and tissues, owing to the presence of so many open spaces along the border, only the best adapted bases should be used, in order to overcome this tendency, and only the best designed and constructed clasps will aid in keeping this adaptation. The well adapted bases, in turn, protect the clasps, teeth and their supporting tissues from abnormal strain at all times.

When we recognize the foregoing requirements of wrought wire clasps, with plastic bases, and have secured them for our patients, we can say that our partial plastic dentures with wrought clasps now show a great improvement in coordination, comfort and harmony of all parts involved.

The evolution of gold clasps antedates the beginning of the nineteenth century. Before then, metal bases were used and the plastic bases were unknown.

Figure 1 suggests the crudeness of clasps, in design and construction, at the beginning of the nineteenth century. No doubt, these were, at that time, considered fine in workmanship and of practicability. This was the beginning of clasp consideration and technic in America. As regards the attempt to secure retention by encircling the tooth with some sort of wrought alloyed gold, or silver wire clasp, we find such old type clasps are being constructed at the present time, which indicates that the ideas of both dentists and laboratory technicians are still rather primitive regarding the clasp design.

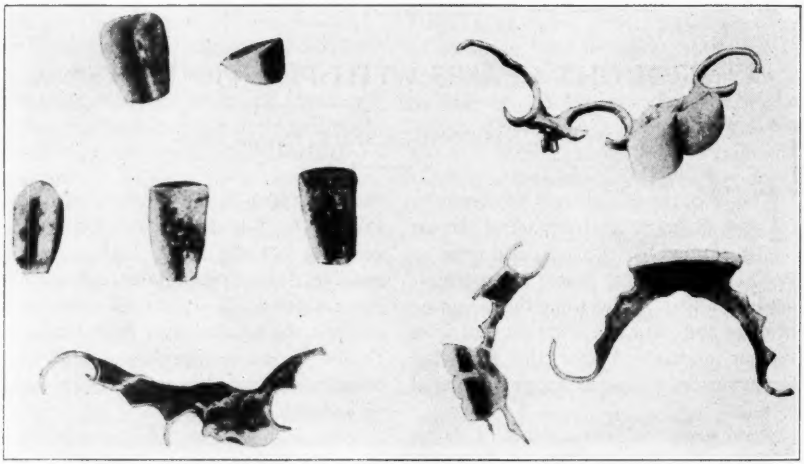


Fig. 1.—Dentures constructed with clasps about 1810. Human teeth were used.

Since nature has not changed the tooth form, the possibilities for clasp retention, namely undercuts for retaining clasps, are the same today as they were then.

For a period of about ninety years, we find no change in clasp design and construction, then Dr. Bonwill came forward with an new and definite principle for attachment of clasp to base. His original communication to the *International Dental Journal,* January, 1893, reads:

The bar holding the clasp and plate must

always be upon the side of the tooth where there will be the least resistance. Take a second inferior molar that has tipped forward very much, and also inclines to the tongue. Here the soldering should be done as far back on the buccal side of the clasp as can be accomplished. Then the spring of the clasp is not needed for the buccal side, but for the mesial and lingual sides. If soldered from the lingual side, it would be impossible to get the clasp on or off.

Figure 2 is a reproduction of Dr. Bonwill's drawing. The first and second molars are missing; the exact place being evident where the bar is soldered to the plate at *c* and *s* on both the second bicuspid and the third molar. This far away point of bar that connects the base and clasp gives the clasp all the free spring possible, and, when in place, hugs

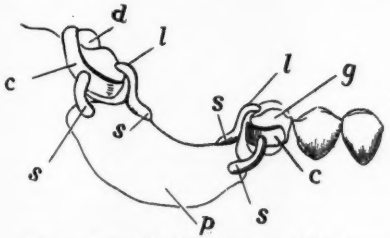


Fig. 2.—Bonwill's drawing of a right lower removable bridge which he made about 1890. *S*, soldering of attachments and lugs (*L*) or occlusal rests to base. The clasps are attached to the base on the buccal surfaces of bicuspid and molar.

the molar firmly, and is never detached by use. Lugs *L* are soldered separately to the plate.

Figure 3 is Dr. Bonwill's drawing, illustrating the attachment of clasp to base, in the upper region. Both of these artificial teeth are held in position firmly by clasps soldered to the base at *S*, the least resistance to the clasp resulting when it slides over the bulge.

In the published records of wrought clasps Bonwill's principles are not employed, except the one by me, published in 1925.[1] Dr. Ottolengui has written a very timely editorial on Dr. Bonwill's principles.[2]

I have looked up these past records to better enable you to visualize, as Dr. Bonwill, Dr. Roach and others have done, the fact that, as soon as one discards the conventional principles of always attaching the clasp to the base at the mesial and distal surfaces, a new engineering field in clasp design and construction is open, and better clasps are built.

As we look toward the buccal surface of the lower first biscuspid (Fig. 4), let us observe the outline of the mesial and distal surfaces diverging inwardly toward the gingival, thereby forming ideal undercuts for the retention of a clasp.

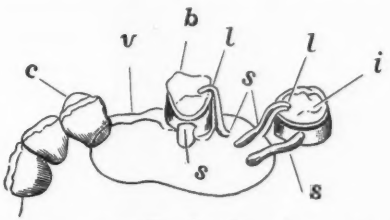


Fig. 3.—Bonwill's drawing of upper removable bridge. The clasps are attached to the base on the lingual surfaces of bicuspid and molar.

The clasps must be contoured just below the bulge or largest diameter of the tooth, depending on the bulge for retention.

In the same tooth (Fig. 5), looking toward the distal surface, we note the outline of the lingual surface diverging inwardly toward the gingival. This surface is well formed to retain the clasp. The buccal outline, not forming an undercut, cannot be called a retentive surface; therefore, we will name it a non-

1. Niswonger, M. E.: D. Summary, 45:1 (Jan.) 1925.
2. Items. Int., 54:869 (Nov.) 1932.

retentive surface for a clasp. On the retentive surface, the clasp must spring over the bulge of the tooth, provided, of course, the clasp has been contoured below the bulge. The nonretentive surface, not having a bulge, and offering no resistance, does not require the clasp to spring; therefore, the attachment of the clasp to the base of the appliance is always placed on the nonretentive surface of the tooth.

If we look at right angles to the occlusal surface (Fig. 6), the only surface visible is the buccal, the nonretentive surface from which the clasp is attached

Fig. 4.—Buccal surface of lower first bicuspid. The clasp is contoured into the undercuts in both the mesial and the distal surfaces.

to the denture. From this right angle view, the undercuts of the lingual, mesial and distal surfaces are completely hidden by the bulge of the tooth.

The upper and lower cuspids have their greatest diameter mesially-distally at contact points and are difficult teeth to which to secure retention for clasps, if the attachments of clasps to the denture are on the mesial or distal surfaces. Retention is not difficult if clasps are contoured into the undercuts, and the attachment made on the nonretentive surface, the lingual.

Another important factor to be considered in this type of clasp construction is the position the teeth to be clasped occupy in the arch (Fig. 7). All lower bicuspids and molars incline upward and inward if in normal alinement. As this inclination causes the buccal always to be the nonretentive surface, the attachment to the appliance is always made there. The nonretentive surface changes from the buccal to the lingual surface in a consideration of the lower anterior teeth, because they incline upward and outward.

The upper bicuspids and molars and

Fig. 5.—Mesial view of tooth shown in Figure 4. The clasp is contoured into the undercut of the lingual surface, while the buccal surface, not having an undercut, cannot retain a clasp.

the six anterior teeth (Fig. 8) normally incline downward and outward, the nonretentive surface thus being on the lingual surfaces. Malposed teeth or teeth not so nearly normal as those that we have just studied must also be studied carefully to determine the surfaces best suited for clasp retention, and the clasp attachment to base.

Figure 9 illustrates the undercuts on every normal tooth due to the bulge. This makes retention of clasps on all the

teeth easy. As stated before, the clasp is contoured to fit just below or above the bulge, and to keep it from the smaller diameter or below the bulge and from becoming loose and illfitting, an occlusal rest or lingual rest is necessary.

We now have the clasp locked on the tooth, so to speak, the bulge retaining the clasp, and the occlusal rest preventing the clasp from sliding to the smaller diameter of the teeth.

Figure 10 shows a clasp for upper second bicuspid. Let us note the gingival contour, the arm or extension for the plastic base and its attachment on the lingual aspect of the clasp and the tapering of the clasp, like that of a steel fishing

Fig. 6.—Occlusal and most of buccal surfaces. The buccal is termed a nonretentive surface as it has no undercut to hold a clasp.

rod, the handle at the attachment of the clasp to the arm; visualizing the amount of spring this clasp is able to perform.

The material for this clasp was originally 16-gage round wire. It was then flattened somewhat by rolling through the gold rolls as plate gold is rolled, which is always one way. If contouring is started from the end which went through the roll last, beautiful gingival contours are obtained.

Figure 11 shows how the wire starts toward the incisor edge after the labial contour has been obtained. At the place where the wire and pencil outline of the clasp separates, contouring is done toward the gingival or outline of clasps. After this has been done, contouring is done toward the lingual surface. As one contours toward the lingual surface, the wire bends toward the incisal edge; in other words, two contour curves take place at the same time, yet only one was actually made and that was toward the lingual surface. This was made possible, as stated before, by use of the wire from the end that went through the rolls last.

Figure 12, *AI*, shows how the round edge facilitates the clasp's springing up over the bulge. *AII* shows how a sharp edge prevents the clasp from gliding smoothly over the bulge. This edge is typical of the half-round and flat clasps used with plastic bases. When clasps are contoured below the bulge, the same principle is employed when they are to be removed. This is illustrated by *BI* and *BII*.

For years I have used a No. 3 wire, a medium priced wire. Bending out of shape and breaking are practically nil, owing to its physical properties and to proper handling of the metal in contouring.

THE PROPERTIES AND PHYSICAL HANDLING

Physical Properties.—The color is gold-platinum (12 per cent platinum). The proportional limit or springiness is more than that of any cast clasp, which means it will hold its shape with the least amount of adjustment after it is functioning over the tooth bulge. Tensile strength (force exerted up to the breaking point, is more than that of any cast clasp, which makes for stronger occlusal rests and base attachments.

Handling of Metal During Contouring.—Every time a bend or contouration is made, the metal must be annealed, because every bend, or contour, causes the wire to become hardened through cold

working. This hardening increases the possibilities of breakage. After the clasp has been contoured, and all soldering operations have been completed, the metal is annealed by plunging from dull red heat quickly in cold water or acid pickle solution. It is desirable for the clasps to go into the mouth annealed, not heat treated.

Fig. 7.—Lower anterior teeth from occlusal plane. The lower anterior teeth have the nonretaining surfaces for clasps on the lingual aspect. The nonretaining surfaces then change to the buccal on the bicuspids and molars. These nonretaining surfaces are the location for the base attachments. (Bonwill's original principle.)

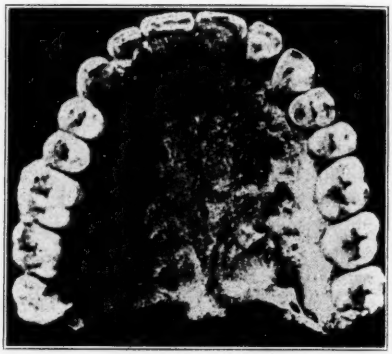


Fig. 8.—Normal alinement of upper teeth, making it possible for attachment of clasp to base on lingual surface. In abnormal alinement, either the upper or lower, this attachment is made on the surface offering the least retention to the clasp.

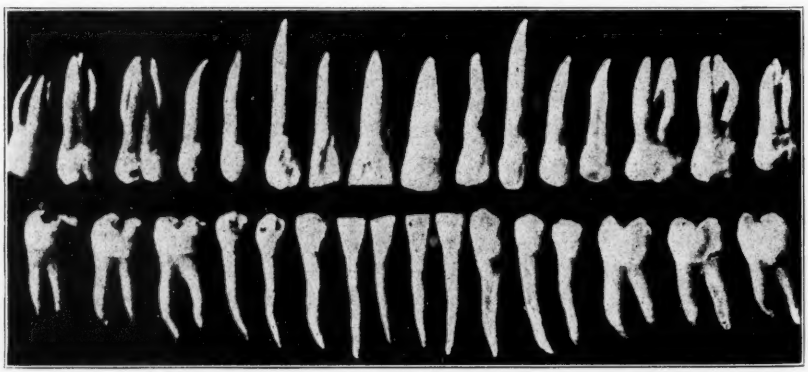


Fig. 9.—Group of teeth showing the mesial and distal surfaces of all teeth, which will not retain a clasp to the fullest possible extent if the attachment to the base is made at either one of these surfaces. If this attachment is made at the mesial and distal surfaces, it prevents the desired movement of clasps over the convexity.

It is true that heat treatment increases the proportional limit or springness, but it reduces the stretching or elongation

limit about 88 per cent. Herein lies the cause of much breakage, and since there is still plenty of proportional limit, or springness, left in the wire after annealing, one can realize the reason for setting the appliance with annealed clasps. Furthermore, all wire clasps and cast clasps become in time hardened, a condition which is produced by springing over the bulge of the tooth. Even in finishing and polishing, sometimes, enough heat through friction is produced to cause clasps to be hardened. We do not wish clasps to be hardened, since hardening decreases the proportional limit. When proportional limit equals tensile strength, the wire cannot be subject to a permanent bend without breakage.

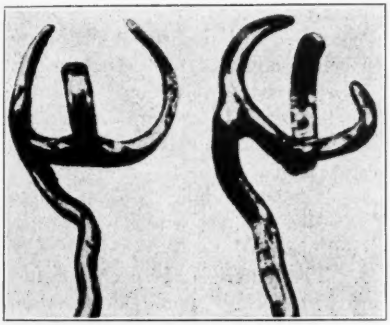


Fig. 10.—Clasp, working space for which to move into as it springs over the bulge must be cut in porcelain tooth at time of setting up teeth.

Now, we will suppose, for example, that a dentist or a technician takes this same wire, or any other wire, including that of high platinum content. He bends or contours clasps without annealing. Hardening results. He solders the occlusal rest and attachment to the base and lets it cool without plunging into water. This hardens it more. He then polishes, which hardens it still more. Finally, he heat treats, either by air cool or oven methods; probably air cool. The clasp looks fine to him because it has a great amount of spring or proportional limit. Then plier adjustments may be necessary when setting the case, which cold hardens it more. In a short time, the patient returns with a broken clasp. Or perhaps the dentist breaks it in adjusting.

Fig. 11.—Tooth bearing dark band that shows relation of clasp to tooth, which is always gingivally to contact point or largest mesial-distal diameter. After the clasp is contoured, the convexity may be cut off of the plaster cast to aid removal of the clasp wire, to solder on the occlusal rest and base attachment.

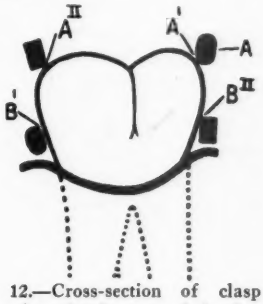


Fig. 12.—Cross-section of clasp wire. *A'B'*, a clasp having rounded edges, after wire has been rolled, will glide more easily over the convexity of the tooth than one having a sharp edge, as *A"B"*, typical of so many present day clasps.

The patient blames the dentist for such unserviceable clasps; the dentist blames the technician, and, in the end, all blame the manufacturer of the gold, although the manufacturer is not to blame. Then the manufacturer, along with the patient, dentist and technician, loses his temper, but the remaining clasps on the case still retain their temper for further disturbance.

This brings up the fact that the word "temper" has been, and continues to be, used improperly. Tempering, according to Webster and all metallurgists, is a softening operation. It is synonymous with annealing, which is also a softening process.

The last advantage of this flattened metal is that it, being narrow, covers very little of the enamel; that, with the aid of capillary attraction, the enamel is continually bathed with saliva underneath the clasps, and thereby, sensitiveness of the teeth is prevented, and decay reduced to the minimum in dirty or uncared for mouths, and even in mouths which are kept clean. The broad clasps which depend upon very close adaptation for retention invite decay because the saliva is not changed frequently between the tooth and clasp. This thought of the tooth bathing under clasps in saliva to reduce decay was one of Dr. Bonwill's principles.

SUMMARY

1. There can be a wider scope of adaptability and usefulness for wrought wire clasps, if their attachments to the plastic bases are made on the nonresistive or nonretentive surface of the tooth.

2. If round clasp material is rolled to flatten it somewhat, and contouring is started from the end which went through the rolls last, beautiful gingival outlined contours will result.

3. Hardening in contouring, plus air or oven hardening, is the most common cause of breakage of wrought wire clasps. As compared with the best oven hardened cast clasps, annealed wire clasps possess a more nearly proportional limit or springiness, tensile strength and elongation. This comparison is like that of steel to stove iron.

4. The worst thing that can happen to annealed wrought wire clasps is bending out of shape.

5. The materials of which a dentist constructs a clasp should in its softest annealed condition, at the time of setting the case, be capable of satisfactory service.

720 Fidelity Building.

DENTAL INFECTION

By A. G. SCHNACK, A.M., M.D., Honolulu, T. H.

PROGRESS has been made in solving many of the problems of dental infection and it might be interesting to attempt to assemble and evaluate some of the conclusions, in order to further a uniform conception of the pathologic issues. With the great mass of disconnected literature presented, it is doubtful that any two persons would of their own accord arrive at a point of view that would show any great degree of harmony. A paper such as this can deal only with the broader aspects of these events and unusual variations must necessarily be neglected. I shall present, in part, a personal viewpoint of some of these findings, trusting that the logic and reasonableness of the assumptions will, at least temporarily, tend to explain events often seemingly impossible of explanation.

The dental profession is zealously guarding its prior rights in this field, but the intimate association of dental conditions with general systemic states makes it impossible for the medical profession to relinquish certain phases of the problem. Many of our ideas are still in the nebulous stage, but a gradual approach to fact may be expected. A broad point of view is essential. Many angles must be considered and a probable explanation of events must be temporarily decided on, with the idea that proof or disproof will follow. A large clinical experience, together with an intimate understanding of the pathologic changes, must be considered equal to or of greater importance than the accumulation of data and statistics often impossible of interpretation. The tendency to isolate a specialty in its investigation can lead only to erroneous conclusions. Contributory factors in a pathologic phenomenon are often neglected and we must realize also that our bodily processes, no matter where located, are in a large measure very similar.

Therapy must not only include local oral treatment, but also should necessitate the intelligent medical care of the entire system for best results. These statements appear frequently in dental literature, but are often lost sight of by the physician and the dentist, with the result that the dentist is content to limit his attention to the task of caring for the immediate tooth condition.

It is my belief that the time is not distant when the dentist's first thought will be, not "What does the tooth show?" but "Why do we find the condition as it is?" No tooth should decay under normal conditions; decay means a faulty oral state. In my estimation, much confusion exists in the attempts at differentiation of dental hypoplasia and dental caries. Hypoplasia of dental elements is often cited as being almost synonymous with dental caries. We have all seen many cases of hypoplastic and defective teeth, some of the most marked character, which show no evidence of caries, even in older people. This does not mean that, in a sense, this hypoplasia is not conducive to caries when proper conditions

arise. My own point of view on caries I have previously expressed,[1] and I shall not dwell in detail on this subject, although we must admit its great importance to our present subject, as caries is by far the most important forerunner of dental infection. Rapid invasion of the pulp chamber by caries manifests itself in pulpitis. With the pulpitis, "pulpal death" ensues sooner or later. Just how this takes place it is difficult to say. The probable loss of the local blood supply through thrombosis of the blood vessels leads to asphyxiation and death of the pulp. The pulp tissue, being nonvital, now offers a medium for bacterial growth which extends into the root canal and dentinal tubules. Outside of local subjective symptoms, such as pain, events follow the rule of simple infection, namely, first, congestion. This may not show in any way except in the roentgenograms where it is evidenced in a thickened pericemental membrane, occasionally accompanied by a very slight periapical clouding. As the periapical area becomes involved, we may have a great variety of events. What determines this is not entirely settled. Much depends on the type or types of infecting organisms. Different organisms have a constant tendency to produce a greater reaction than others. We know some will cause leukocytes, others lymphocytes, plasma cells, endothelial cells, epithelioid cells, eosinophiles, etc., to accumulate at different stages of the process. As the reaction continues, owing to bacterial and tissue digestion and the results of altered circulation, oxygenation, etc., the local reaction may change to a marked degree. This brings about not only variations in the cellular and tissue responses, but also a variation in the local edema.

1. Schnack, A. G.: Dental Caries, J.A.D.A., 19:62-68, (Jan.) 1932.

As to just how local peridental immunity is brought on, we hesitate to speculate, but it is fairly safe to state that it follows a course similar to that occurring in other tissues. The medical literature abounds in theories. Secondary superimposed infection, not only about the tooth apex but elsewhere, will alter the periapical reaction. As we know, the introduction of any protein into the circulation, intravenously or by intramuscular or subcutaneous injection, creates a systemic reaction and also a "focal" reaction at the site of an existing focus anywhere in the body. This reaction is more marked if the protein introduced is bacterial and of the same species as is found at the site of infection to which the patient has become sensitized. For example, tuberculin treatment has this specific object in view. The stimulated tuberculous focal infection is thought by some to result in better focal immunity, perhaps in great part due to the fibrosis resulting from this stimulation. In tuberculosis, cases are carefully selected, because those which already show evidence of considerable focal exudate may react too violently to tuberculin and much tissue destruction result.

Individuals react quite differently to different stimuli and infections. Some persons react violently to all types of infection, while others react more seriously to certain specific infections. This is often manifested in the white blood cell count in acute infections. As we know, serious infections may bring about a very high count; while again, an overwhelming infection by the same organism may result in a lowered count. General debility and anemia frequently prevent the normal blood cell response. The focal reaction is not gaged entirely by the cellular elements in the exudate, as

the accompanying edema is also quite a variable element in the local reaction and very important in its results. The amount of exudate or edema depends on the vascularity and the absorbing ability of an infected tissue to quite a marked degree. Dense fibrous tissue, because of its avascularity and inability to swell, tends to a lesser exudate. A big factor in addition to this is the so-called "allergic" state or sensitivity of the patient to the infection. Much remains to be proved on this subject. Whether individuals who are allergic or sensitized to one type of infection have a tendency to the production of much exudate with other infections is difficult to prove, but it is assumed that allergy is more or less specific for different infections.

This discussion is important in the consideration of dental apical infection. The apical reaction has much to do with the general appearance and course of an apical infection, as seen in roentgenograms, and a general understanding of this must be a useful consideration in the treatment of such cases. Roentgenologic evidence changes almost from day to day, and a careful analysis of this, together with the local and remote clinical events, is a necessity.

Before entering on a description of apical conditions, it is well to mention briefly certain facts. We all see patients with multiple dental abscesses, with apparently no clinical disability, while others may suffer from severe arthritis or other disability which may be traced to a slight dental infection. Arthritis, in most cases, must be looked on as due in great measure to an allergic reaction. In rheumatoid arthritis, by the use of special culture methods,[2] a high proportion of joints have been proved to harbor streptococci, usually of the viridans and hemolytic types. Blood cultures in a smaller percentage of these cases have shown these same organisms. While we formerly thought that joint swellings were most frequently purely the result of toxic absorption from a focus of infection, we again approach the original point of view that most of the joints or the periarticular tissues actually harbor organisms. The bacterial irritation produces a certain degree of swelling, but "flare-ups" and much of the edema is generally an allergic manifestation, the result of stimulation from the absorption of products of the focal infection. One infected joint may act as a focus for stimulating the reaction about other joints. We must not lose sight of the fact that the local joint reaction may also be stirred up to a certain degree by remote infection, by the presence of entirely different organisms, trauma or the use of drugs, and in many other ways. Why joints in one case should show the allergic manifestation, while in others we find myositis, bursitis, tenosynovitis, neuritis, etc., can no more be explained than other allergic responses, such as asthma, hayfever, rhinitis, eczema and angioneurotic edema. Either an individual hypersensitivity develops or we may find familial or hereditary tendencies to such conditions. This indicates that one cannot judge events by the degree of apical involvement, but must consider the patient as a whole in determining what therapeutic procedure to follow. Radical extraction is indicated in one case, whereas one should hesitate in

2. Burbank Reginald: Chronic Arthritis, J.A.M.A., 99: 1489 (Oct. 29) 1932. Clausen, B. J., and Wetherby, M.: Experimental Basis for Vaccine Therapy in Chronic Arthritis with Summary of Results Obtained in Patients, Ann. Int. Med., 5 (June) 1932. Schnack, A. G.: Dental Infection, Ann. Int. Med., 3:63-70 (July) 1929.

others. As stated, periapical infiltration is dependent in great part on local hypersensitivity. What is called an apical abscess is the result of the local pressure resulting from this infiltration. A tooth apex that has free drainage through the root canal and pulp chamber will not show much periapical absorption unless the drainage is blocked. Unphysiologic pressure phenomena in any part of the body lead to tissue necrosis, or, better perhaps, tissue absorption. Just what part the scavenger cells (osteoclasts? plasma cells?) play, it is difficult to prove. We do not know whether there is active solution of living bone in these pressure areas, or only devitalized bone is removed by these cells. The rapid regeneration of new bone in these areas after drainage is established would hardly point to the presence of much devitalized bone tissue. We are often surprised at the extreme rapidity with which an apparently large periapical abscess disappears roentgenographically after drainage is established. The new bone is thick and there is temporarily a certain amount of local lime deficiency, owing to the presence of irritating bacterial and tissue products.

This picture is best followed after tooth extraction After the local infection has cleared up and irritating substances have been eliminated, we find a tendency to the production of normal cancellous bone. This same tendency is seen in other bony structures. Muscle paralysis, by altering stresses and strains on the skeletal bones, will result in entirely different alinement of bone cancelli. A persistent irritation at the site of a previous apical infection will retard the return to normal of the surrounding bone structure and can be used as a diagnostic point. A very rapid absorption of a periapical area may result in abscesses, antrum infection and swelling of the face from puncturing of the alveolar bone cortex, and one may be surprised to see how watery and thin the discharge is. The material frequently is mostly clear fluid, with few bacteria and cells. The consensus of opinion is that, in these acute stages, there is danger from dental extraction or incision of such swellings, as no protective wall has as yet been established to hem in infection. As fibrosis and avascularity set in, a periapical cyst (granuloma) becomes established. How effective this becomes in preventing the escape of bacteria or toxins depends on numerous conditions, and our judgment is often taxed as to what part such a condition may play in certain systemic conditions. Unfortunately, the roentgen rays do not always reveal just what is going on about the tooth root, but certain findings seem to warrant consideration.

Local irritation almost invariably results in thickened cancellous disarranged bony structure. When we see periapical abscesses of long standing (granuloma) clearly demarcated from normal looking bone, we may feel fairly certain that there can be no absorption going on from the previously infected zone. The presence of a thin white line wall deposited about the apical "granuloma" makes us doubly certain. The normal bone density may make it impossible to determine such points in all cases. Many cases of periapical infection, whether due to drainage or a lack of local hypersensitivity, do not go through the stage of periapical bone absorption (abscess). Slight thickening of the periapical structures with slight periapical clouding, often extending a considerable distance from a tooth apex, may represent the only evidence of infection. Such infection often shows no roentgen-ray evi-

dence of walling off and perhaps offers more difficulties in their elimination. Serial roentgen-ray studies over a considerable time may be the only means to determine what we can expect after dental extraction.

Whether periapical abscesses can rightfully be spoken of as indicative of osteomyelitis is an open question. The process seems entirely different. Severe osteomyelitis, as we know, may originate from dental abscesses especially after extraction when the periapical protective wall has not yet formed or this wall has been broken down by fracture or local trauma, but it is generally an accident. Arterial thrombosis is thought by many to best explain osteomyelitis. The infected thrombus results in bone necrosis and general bacterial invasion of the bone. Periapical abscess may be thought of as being almost self-limited, which is not the case in osteomyelitis, in which the thrombosis may extend to main arterial trunks, or extend by invasion of the bone medulla or subperiosteally. The rapid regeneration of bone after the draining of the periapical abscess scarcely points to much local bone necrosis.

Any pus infection whether in bone or soft tissue requires a positive pressure to produce local and systemic clinical symptoms. An abscess which has drainage is seldom accompanied by fever, local pain, redness, etc. The infection might be considered to be like the head on a column of water. Little absorption or diffusion of toxin from such an area takes place when the pressure head is low. The area of clouding which surrounds an acutely infected apex does not in any way tell us how widely involved the periapical bone area is. Just what point marks the limit of bacterial invasion, at just what point the exudate represents the reaction to absorbed toxins and irritating products, and just where the outermost layer of exudate, which is merely the result of vascular congestion, extends beyond the irritation zone, is impossible to determine. As the inflammatory reaction subsides, we find the actually infected zone may be limited to a very small periapical area. The process of bone absorption is not apparent immediately and the area of absorption may or may not represent the area of actual bone infection. The more acute and rapid the exudate, provided there is no drainage, the greater the amount of periapical absorption. As the process subsides, the abscess becomes better and better demarcated, eventually becoming the "granuloma." It is my opinion that the granuloma does not always circumscribe all the infecting organisms, to judge by the clouded, thickened cancelli frequently seen beyond the granulomatous zone. This is important in prognosis.

The condition of the tooth apex is a point to consider in judging the activity of a periapical lesion. Absorption of the lamina dura and elevation of the foraminal pericementum by the "abscess" leaves a portion of the apical cementum uncovered. This becomes devitalized and we may rightly speak of a "dead" apex. The apex later acts much as a foreign body; which results perhaps in a somewhat different reaction. Scavenger cells may cause some absorption of cementum. The process is somewhat similar to the absorption of deciduous teeth. A hypercementosis occurring at the margin of the still attached pericemental membrane would indicate irritation of a very mild character in some cases, while in others it might indicate an attempt at tooth restoration under slightly unfavorable conditions. One's judgment is taxed.

Here, as stated above, individual systemic idiosyncrasy or hypersensitivity must determine one's procedure, and one must remember that while teeth frequently are the source of systemic symptoms, other possibilities must not be lost sight of. Many aches and pains subside without any special treatment, and too rapid enthusiasm for dental extraction may lead one to erroneous conclusions. Perhaps the pain of extraction acting as a counter-stimulant may temporarily divert nerve impulses to other channels. The use of liniments, diathermy, rubs, massage, muscle-stretching, etc., may lessen muscle spasm with its tender joint complex. (Nature often overdoes its part in caring for a slight disability.) Just how to explain the immediate exacerbation of joint symptoms after tooth extraction in many cases is not easy. It has been thought that the macerated tooth socket and apical abscess allow a greater absorption of local toxins and dissemination of the infecting organisms. An exacerbation of the local joint symptoms of arthritis soon after dental extraction is thought to prove the relationship between the joint symptoms and the dental condition. This is not always borne out in judging the late lasting effects.

The events following dental extraction may require elucidation. My personal point of view perhaps varies somewhat from commonly accepted theories. Devitalized tissue about the apex of a pulpless tooth offers a good medium for bacterial growth. The presence of the dead apex seems to be responsible for the continuance of the periapical infection, as most extractions sooner or later result in a clearing of this infection. Live tissues in and about a joint may harbor organisms, but there is usually a certain amount of tissue immunity which does not allow the rampant growth of organisms. As previously stated, the joint reaction is the result of the bacterial invasion directly, plus the allergic response to the superimposed irritant, which, in this case, is the focal infection about the tooth. It should be plain that extraction of the tooth will either cause a temporary flaring up of the joint reaction, or by removing this irritant (allergen) cause a marked recession in swelling and irritation of the joint, and, with this, produce a feeling of comparative well-being. The actual joint infection probably takes a long time to clear, this depending on the local immune reaction and the degree of previous tissue damage. To aid the final clearing process, it seems quite reasonable to attempt the eradication of the infecting living organisms by the use of vaccines made from joint cultures or the tooth-infecting organism. Recent work[2] would indicate that intravenous vaccine therapy rather than subcutaneous or intramuscular therapy is more effective in destroying living organisms, at the same time desensitizing the hypersensitive individual. It is apparently not merely a matter of extraction.

While multiple apical abscesses may not result in typical arthritis or so-called allergic conditions, there are frequently milder symptoms, such as malaise, irritability, gastro-intestinal symptoms, headaches and many other conditions which frequently do not direct our attention to the teeth. The absence of hypersensitivity on the part of the patient perhaps explains the lack of acute symptoms in spite of actual infection of joints and other tissues. The toxins absorbed could explain most of the symptoms.

A great variation of opinion exists as to the part played by periodontoclasia in arthritis and similar conditions. I have hesitated to assume that pyorrhea is an

important element to consider. While we do see patients lose their arthritic symptoms after dental extraction for pyorrhea, the process is generally considered somewhat different. Just what part malocclusion, mastication, the nature of foodstuffs, the presence of tartar, local trauma and infection, and the vitamins play in pyorrhea is still a moot question. Gingivitis is usually a very gradual process. We probably start with the inflammatory process in the gingiva, perhaps even before actual bacterial invasion occurs.

As stated above, a positive pressure within an infected area is necessary to produce appreciable absorption and systemic symptoms. While cross-sections of the gingiva show a considerable infiltration of white blood cells and bacteria the infection takes place from without, travels inward and practically retains outward drainage throughout. It is very much like an open wound. The tissue is infected but draining freely. Lateral or pyorrheal abscesses may become closed off occasionally and should then act very much as apical abscesses. There could also be some direct absorption into the gingival circulation to a mild degree. Pyorrheal drainage into the mouth is the usual thing and, except for a possible effect on the gastric mucosa, should not cause systemic complications, as most toxic products entering the portal circulation are detoxified in their passage through the liver. One cannot exclude the possibility of bacteria entering directly the systemic circulation, making extraction of teeth because of pyorrhea a necessity. Here, as in apical infection, one may be erroneously influenced by the amount of apparent involvement seen in the roentgenogram. As previously stated, individual idiosyncrasy, hypersensitivity and the general physical condition are vastly more important factors.

From the foregoing considerations one cannot help being impressed by the general indefiniteness of the problem. So many facts are to be considered. No statement can apply to all cases. The problem is medical as well as dental in many of its aspects. Many results may be erroneously interpreted. A careful consideration of the roentgenographic evidence may often allow one to judge with a fair degree of accuracy as to when lasting results may be anticipated. In a large proportion of cases, one is forced to abide by certain broad rules that practically all pulpless teeth harbor a certain amount of infection. Much less is frequently to be seen in a roentgenogram than one would like to see, and evidence is obtained that can be followed in only a broad sense, the line of procedure being based almost entirely on the systemic condition. While one may, from a practical point of view, get little value from a long theoretical discussion, it should be interesting to consider the various elements entering into the problem of dental infection.

SUMMARY

The mechanism of peridental infection is described as similar in great part to infection elsewhere in the body.

Systemic symptoms are the result of the absorption of toxic products from focal and systemic bacterial invasion, exaggerated by the hypersensitivity of the individual.

Therapy should be directed toward the eradication of the infection and the diminution of the patient's hypersensitivity.

LUDWIG'S ANGINA AND CERVICAL CELLULITIS (DIFFERENTIAL DIAGNOSIS)

By WILLIAM P. HYDE, D.D.S., Brooklyn, N. Y.

THE science of medicine, although a very old one, is still making progress through the keen observations of men who search for truths among human ailments and the healing thereof. Modern clinicians are doing a great deal toward furthering medical progress. Two classes of practitioners are to be found among our research workers. On the one hand, we have that group who unhesitatingly caption every new symptom or complication as a new disease; on the other, a more conservative group who always make a subdivision of the already cataloged diseases. It is to the former group that the art and science of medicine owes its progress; for it is this group which no doubt present new symptoms and their sequelae. These, perhaps, may have long been in existence, but, overshadowed by more prominent and common complications, have remained in the background untouched by clinical observations.

Thus it has been with Ludwig's angina. For ages, this condition existed in the human race, but it was not until 1836 that Dr. Ludwig, a surgeon in Stuttgart, first presented observations on a disease which thenceforth was called "angina ludovici." Because there are a goodly number of physicians and dentists who throw every cervical or submaxillary swelling of morbid appearance into the catagory of Ludwig's angina, this paper is presented, that a definite differential diagnosis may be arrived at between a true Ludwig's angina and a submaxillary swelling of mammoth size.

Let us consider what is meant by the term "angina." Is "Ludwig's" affixed before the word any more descriptive? Just as Riggs' disease is an accepted appellation for the condition labeled from pyorrhea to periodontitis complex, so are we justified in calling Ludwig's angina such. The term "angina" was originally applied by Latin writers to a condition in which difficulty of breathing and of swallowing existed, either together or separately, accompanied by a sense of choking, caused by a disease condition located between the mouth and the stomach. It further expressed an inflammatory condition of the throat, or contiguous parts. When Dr. Ludwig observed clinically the symptoms and the morbid anatomy of an angina which had, up to then, been referred to only casually, he presented a paper listing his findings and calling the condition a new disease, a special form of submaxillary cellulitis. In the caption of this paper, I mention the term "cervical cellulitis," referring to an infection of the submaxillary spaces involving the soft tissues therein.

For a better comprehension of the diagnosis, pathology and symptoms coming under the terms "angina ludovici" and "cervical cellulitis," a brief review of the anatomy of the parts involved will be found useful.

The oral cavity is divided into the

mouth proper, which lies within the arches of the teeth; and the vestibules, upper and lower, which, in turn, lie between the buccal parietes and the teeth and gums. The vestibules communicate with the mouth by the small interval, distad from the last tooth in the arch. Posteriorly, the mouth proper opens into the pharynx through the isthmus of the fauces. The isthmus of the fauces is bounded above by the soft palate and below by the dorsum of the tongue. The roof of the mouth is formed by the hard palate which runs into the soft palate posteriorly. The floor of the mouth is formed anteriorly by the reflections of mucous membrane from the mandible to the under surface of the tongue.

Immediately below this mucous membrane are the two mylohyoid muscles forming the muscular floor of the mouth. When these muscles contract, they elevate the hyoid bone and, with it, the root of the tongue. The mylohyoid muscle arises from the anterior two thirds of the mylohyoid line of the mandible. The posterior fibers are inserted in the pit of the hyoid bone, the anterior fibers inserted in the median raphe. The mylohyoid muscles are innervated by the mylohyoid branch of the inferior dental nerve. The posterior border of the muscles serves to cover the roof of the deeper part of the submaxillary gland. The gland lies also partly under cover of the inner surface of the body of the mandible and partly under cover of the investing layer of the deep cervical fascia. The deep surface of the gland rests on the anterior belly of the digastric and mylohyoid muscles and the common tendon of the digastric and mylohyoid muscles.

The hyoglossis muscles run deeply into the mylohyoid muscle to reach the side of the tongue. The styloglossis muscle also runs to the side of the tongue and intermingles with the fibers of the hyoglossis. The tip and dorsum of the tongue is formed by the genioglossis muscle, which arises from the mental spines and widens out in fan-shape. The geniohyoid muscle which also arises from the mental spines goes into the hyoid bone.

The anterior two thirds of the tongue is supplied by the lingual nerve as a sensory nerve, while the chorda tympani nerve of the seventh, running along with the lingual, takes care of the motor innervation. The hypoglossal nerve is a motor nerve which supplies the intrinsic muscles of the tongue. The glossopharyngeal nerve supplies the posterior third.

The tongue is a solid mass of muscle which is covered by mucous membrane, the muscular fibers being separated by a certain amount of areolar tissue. The under surface of the anterior part of the tongue is connected with the floor of the mouth by means of the frenulum. This ridge of connective tissue is in the midline. On either side of this frenulum, there is a small papilla, on whose summit is the duct opening of the submaxillary gland. Also, on each side of the frenulum, is a delicate fringed ridge, the plica fimbriata. This indicates the position of the lingual artery. Internal to the artery and between the frenum and the plica fimbriata is the ranine vein. Near the apex of the tongue, beneath the mucous membrane, are the anterior lingual glands or glands of Nuhn. A dilatation of one of the ducts of these glands constitutes one variety of ranula.

The topographic anatomy of the tongue is as follows: At the junction of its anterior two thirds with its posterior third, there is a v-shaped groove, termed the sulcus terminalis. At the apex of this groove is a pitlike depression, the foramen cecum. The anterior and posterior parts of the tongue are developed from different parts of the primitive pharynx and

differ from one another in function, in structure of the covering and, as has already been pointed out, in the sensory nerve supply.

In the anterior section of the tongue are three types of papillae. The circumvallate papillae, which are ten or twelve in number, lie immediately beneath the sulcus terminalis. The fungiformis papillae are on the tip and the margins of the tongue. These are smaller than the circumvallate papillae and are bright red, each consisting of a narrow pedicle with an enlarged rounded head. Then we have the cornical papillae, giving the tongue its characteristic velvety appearance. These are the smallest and most numerous of the papillae. The posterior third of the tongue is characterized by the presence of lymphoid, serous and mucous glands in the submucosa. Superficially, the front and side of the neck is covered by the platysma muscle. This lies over the superficial fascia. Some of the fibers reaching the neck mingle with the muscles of the lower lip.

Pulse, Respiration, Temperature and Blood Changes in Cervical Cellulitis

Patient	Operation Prior to Infection	White Cell Count	Polymorphonuclears	Small Lymphocytes	Pulse	Respiration	Temperature	Outcome
23216	Extract. 8	9,000	77	10	100	30	102	Recovered
21018	Extract. 7	12,000	84	12	150	40	105	Recovered
20155	Extract. 7	13,000	84	3	110	22	102	Recovered
19788	Extract. 6	10,200	78	12	94	22	101	Recovered
19674	Extract. 7	10,000	75	18	110	24	101	Recovered
19403	Extract. 7	10,500	74	14	100	24	101	Recovered
19063	Cut on gum during cleaning	13,500	80	15	106	24	101	Recovered
18938	Extract. 8	13,800	81	12	100	40	104	Recovered
Mr. M	Extract. 8	11,000	74	15	101	22	102	Recovered
Miss C	Extract. 6	10,000	78	12	100	20	101	Recovered
			Ludwig's Angina					
17381	Cold and tonsilitis	16,000	80	11	100	40	105	Death
19762	Erupting tooth 8	7,500	55	37	140	60	103	Recovered
19466	Extract. 6	13,500	84	9	120	34	104	Death
Mrs. L	Extract. 6	13,000	80	9	125	40	105	Recovered
Mr. K	Extract. 7	14,000	86	9	140	60	107	Death
Mr. Ke	Extract. 8	13,500	84	7	130	35	105	Recovered
Mr. C	Extract. 6	17,000	80	10	130	35	103	Recovered
Mrs. B	Extract. 7	14,500	84	12	140	29	105	Recovered
Mr. R	Extract. 8	15,500	79	9	125	34	102	Recovered
Mr. W	Extract. 8	13,500	84	10	124	28	103	Recovered

With the foregoing anatomic picture, we shall now consider both Ludwig's angina and cervical cellulitis from an etiologic standpoint. Both conditions may be of dental origin. Cellulitis may follow a pericoronal infection. The extraction of an infected tooth may be the cause of a cellulitis; or this malady may develop be-

fore the extraction of the offending tooth, if an infectious process has already asserted itself.

Asepsis in the surgical armamentarium is always of vital importance. The use of nonsterile instruments may be the forerunner of a cellulitis. A needle may carry infection from the outside into the tissues or may force infection within the tissues to an even deeper stratum. Often, an impacted wisdom tooth may cause a cellulitis. Then again, the extraction of pyorrheic teeth may create this condition when local anesthesia has been used, and the infection may be carried deeper. A few cases of cellulitis have been observed after an otitis media, where the infectious process may have set in via the eustachian tube. In the case of cellulitis, the condition seems to appear invariably after the extraction. The general health of the patient is an important factor in its inception. Very often, an incipient Ludwig's angina is halted by the physical resistance of the body. Infected tonsils may be the foci, which, by direct infection, may lead to an angina. On the other hand, a Ludwig's angina may be entirely idiopathic.

In our work in the bacteriologic laboratory, our findings are of vast significance. Smears taken from suspected cases and cultures showed numerous colonies of staphylococci in those patients with cervical cellulitis. In the cases of true Ludwig's angina which we have treated, we have always found a mixed and virulent infection with the streptococcus as the most prominent colony. Streptococci, while exciting local suppurative and inflammatory processes, also produce generalized systemic infection. In deaths following Ludwig's angina, the local conditions are the determining morbid factors more often than is the general septicemia. The gram-positive cocci, isolated from these oral lesions, indicate the high pathogenicity of the invading micro-organisms.

It can therefore be expected that the angina will present definite clinical symptoms which can, by careful observation, be recognized and differentiated. If an incision is made in the floor of the mouth and the external swelling is lanced when the patient first notices it, pus will be located in every case of cellulitis, but this is not so in Ludwig's angina. In the latter complication, we may obtain only a slight serous discharge, indicating a gangrenous process on its way, rather than a purulent reaction. In Ludwig's angina, the swelling is hard, leathery, boardlike and painful to touch over its entire area. It spreads very rapidly from beneath the mandible to the floor of the mouth and the anterior surface of the throat, where it will cross the median raphe. The cervical tissues are now under tension and, as the disease progresses, the process forces the tissues to extend to the sublingual spaces. This takes place within a few days, sometimes invading the glottis by edema and sometimes terminating by sloughing of the soft parts.

The infection, having worked its way anteriorly, has crossed the median raphe. It is now anterior and continues to become bilateral. In cervical cellulitis, we see an infection localized to the posterior part of the side of the neck and unilateral. The Ludwig's infection is seldom localized and is usually bilateral.

Further symptoms are extremely painful deglutition and phonation. The floor of the mouth may be raised to the level of the teeth and the induration of the tissues may even force the tongue upward and backward until the entire submaxillary space is occupied by the tongue. The floor of the mouth is raised owing to the hyperemic condition of the areolar tissue within the mylohyoid muscles. Edema is pres-

ent within the fibers and the floor of the mouth is an angry red. The edema within the areolar tissue of the intrinsic tongue muscles causes the tongue to be raised so that its posterior third is very taut. The pressure within the tongue causes a desquamation of the epithelial cells in the region of the sulcus terminalis, as well as an impairment in the sense of taste.

Anteriorly, the plica fimbriata is very pronounced. It stands out as red folds on whose surface white, desquamated and dead epithelial cells may be seen. The general swelling resulting may produce compression of the larynx, with resulting dyspnea. The symptoms of an obstructed larynx are a rather late manifestation. If the glottis becomes involved, suffocation follows. These symptoms are the result of the rapid and extensive involvement of the tissues and their strangulation by the necrotic and sloughing process. On section, the connective tissues present a sloughing, grayish black, phlegmonous condition. It is not until the condition is fairly well advanced that incisions reveal pus.

A cervical cellulitis presents a clinical picture that is different in many important respects. A sublingual phlegmonous process may assert itself in the severe and acute forms of cervical cellulitis. Yet this significant feature should not be the cause of a hasty diagnosis and the captioning of this malady as Ludwig's angina. It is this confusion that we now desire to clear up by presenting the true picture of a cervical cellulitis.

To begin with, the swelling of the jaw may precede or follow an extraction. Several days may pass for the process to progress slowly and diffusely. The skin will present the classic symptoms of swelling, redness, heat and pain. The latter symptom is especially pronounced at the locus of pointing. Here, at once, is a differential point to remember. A true Ludwig's angina presents an evenly colored skin over the diffuse swelling, which is painful to touch over its entirety. This is not so with the cervical cellulitis. Although it starts locally, the cellulitis will spread, usually, from above downward; that is, from the sublingual to the submaxillary tissues. The reverse holds true for a Ludwig's angina. To the touch, the swelling presents a somewhat fluctuating mass, very similar to that of a rubber ball. On incision, quantities of frank pus will be revealed which do not appear in true Ludwig's angina. A swelling that may last over several weeks or months can be labeled cellulitis, for a true Ludwig's angina either clears up on intervention or runs its course rapidly and devastatingly within a short time.

Other important symptoms involve the blood. The accompanying tables serve to show the various changes in the blood system.

A differential count in the cases of Ludwig's angina shows a slightly higher white count than in cellulitis. This count in Ludwig's disease runs from 9,000 to 20,000. In 480 recorded cases of cervical cellulitis, the count ranged from 9,000 to 14,000. The average here in cervical cellulitis is from 10,000 to 11,000; whereas, in a Ludwig's angina, the average is from 12,500 to 14,000. This indicates the virulence of Ludwig's disease. In both diseases, the polymorphonuclear leukocytes seem to number the same; but as far as small lymphocytes are concerned, their average percentage would be from 9 to 11 per cent in a Ludwig's angina and from 12 to 15 per cent in cervical cellulitis.

In recording the rates of pulse, respiration and temperature in both diseases, some interesting data were obtained. As far as the pulse and respiration are con-

cerned, in cervical cellulitis, the pulse rate averages 102 and the respiration, 23. In the case of Ludwig's angina, the pulse average is from 120 to 125 and the respiration 28 and 35.

The temperature changes also vary here. In Ludwig's angina, the temperature is slightly higher than in cellulitis. The thermometer registers from 102 to 107, the average being from 104 to 104.5. The temperature averages have been obtained from thirty-eight cases of Ludwig's angina which we have treated within the last thirteen years. In cervical cellulitis, we found temperatures running from 101 to approximately 105, the average registering about 102 to 102.5.

Incisions made in both cases result in different effects on the temperatures. After incision and drainage is made in the Ludwig's angina, the temperature tends to remain the same. In the cellulitis, a change is noticed within twenty-four hours; that is, a lowering of temperature follows incision.

From their comparative differences, in about 480 cases of cervical cellulitis as compared to thirty-eight cases of true Ludwig's angina, it may seem rather difficult to present an absolutely true statistical picture. Realizing the rarity of Ludwig's angina as compared with the frequency of the cellulitis, we firmly believe that these comparative differences in temperature, pulse, respiration and blood picture are something that should be looked upon with a certain degree of consideration.

From the accompanying table, I have drawn the conclusions embodied in this paper. Realizing the importance of early and correct diagnosis, I have presented the cardinal features of both cervical cellulitis and Ludwig's angina, that they may serve as guides for the general practitioner. The clinical material used to obtain these observations had been carefully weighed before presentation.

857 Eastern Parkway.

DENTAL EDUCATION OF THE PUBLIC*

By C. WILLARD CAMALIER, D.D.S., F.A.C.D., Washington, D. C.

IN approaching the problem presented by the question of educational publicity, I do so with a knowledge of the Code of Ethics of the American Dental Association and efforts in this regard by various state associations, city and county societies, and the A. D. A. itself. It is unnecessary for me to defend the general subject of the dental education of the public, because, I feel, all dentists are agreed that some method of education should be used, if the prevalence of caries and other mouth diseases is to be minimized with the resultant improvement in the health of the individual and of the nation as a whole. In a report published by the U. S. Public Health Service, we find the following statement:

> In a report of a very extensive survey of the mouth conditions in the State by the North Carolina State Board of Health it is stated that 75 per cent of the children

*Read before the North Carolina Dental Society, Chapel Hill, N. C., June 7, 1933.

examined evidenced beginning decay of the teeth and less than 10 per cent of them had ever visited a dentist, and that 90 out of every 100 parents had never made any attempt to have the dental defects of their children corrected.

Statistics quoted relate largely to rural children. However, reports from several of the larger cities reveal a very high percentage of dental decay in the children attending school, ranging from 30 to 62.7 per cent, depending largely on the dental attention that had been given these children during the years previous to the examinations on which the statistical report was based.

In view of the lack of attention to the dental needs of the children of the land, it is not surprising that of 925,873 men who were found unfit for military duty by the first selective draft examinations, by reasons of physical causes, the second highest of all causes of physical rejections was that of dental defects.

In a report by Thaddeus P. Hyatt, dental director of the Metropolitan Life Insurance Company, we find the following quotation:

Some interesting figures are given upon dental caries by Mr. F. C. Nichols, M.C., M.B., Ch.P., M.R.C.S., L.R.C.P., England, Assistant Dental Surgeon, Royal Infirmary, Bristol, and Clinical Lecturer, Bristol University, England.

Mr. Nichols took five hundred children of the age fourteen. He selected this age for three reasons:

First, it is the age of puberty.

Second, the age when the child leaves school.

Third, the age when work is usually commenced.

Only two children out of five hundred were found to be free from caries. This is less than one-half of one per cent In the following table we find both the number of teeth lost, as well as the number of teeth which are so badly decayed that extraction is indicated. I have added these together to show the loss of masticating teeth.

Dr. Joseph A. Murphy, Chief Medical Inspector of the Public Schools of the District of Columbia gave me this statement before leaving, which indicates the conditions as existing in the capital of the nation.

The salient facts in this report are:

Number of pupils examined 24,723, number of pupils having dental defects 77.8%, average number of carious teeth per pupil, 2.319.

It is my impression that additional defects are constantly found by dental operators, so that the statistics of the dental inspectors if translated into actualities would show the percentage of defects existing higher than the table indicates.

Teeth Lost, or So Badly Decayed That Extraction Is Necessary

	Total Number	Number Lost	To Be Extracted	Total Loss	Per Cent of Loss
Children	500				
First molars	2,000	258	286	544	27
Second molars	2,000	119	47	166	8
First biscuspids	2,000	14	40	54	3
Second bicuspids	2,000	61	63	124	6

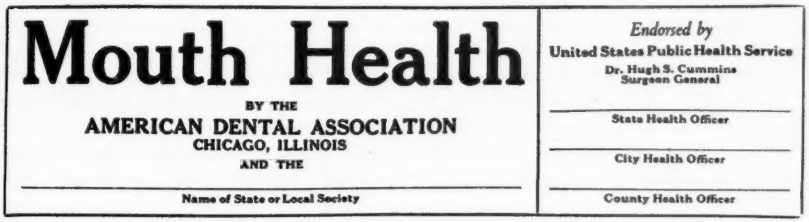
These statistics, in my opinion, represent pretty well the situation throughout the U. S. In fact, similar data have been prepared from other jurisdictions, and with this information before us, even in a state like North Carolina, where ultra-conservatism is the rule and the standards of ethics are very high, I am sure that you will not find a dentist who is opposed to the proper kind of education of the public. It seems that the logical way to consider this problem, to place it in its proper sphere, is first to analyze the motive, and then follow with the character of the information to

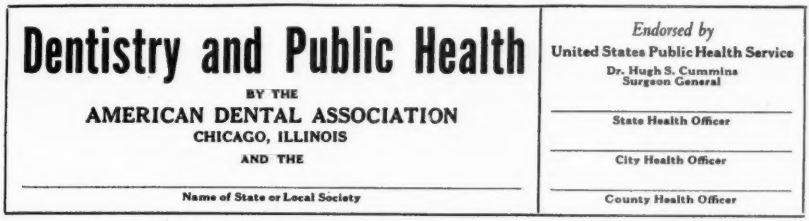
be imparted, and the method of disseminating it.

Let us first, therefore, consider the motive. Why is the dental profession interested in the education of the public? I quote from a pamphlet issued by a large advertising concern to its agents following the approval by the publicity committee of a certain type of educational publicity:

this country, this means that the American public spends something like $335,000,000 annually for dentistry. This sounds like a huge sum, but per capita it represents only $2.75. The American people need more dental care. More money is spent yearly for cosmetics than for dentistry, yet no one disputes the beauty value of good teeth.

The dentist's gross income should be larger and can be made so by educating only a small part of the public to the point of wanting dentistry, the same as they want





Above: Style considered by committee. Below: Style preferred by committee and subsequently approved by the A.D.A. at the Annual Session held in Chicago.

THIS INFORMATION WILL HELP YOU INTEREST DENTISTS IN PAID PUBLICITY

There is a distinct difference between advertising and educational publicity. *Dentists should not advertise.* They should not descend to the commercial plane with the great service that they have to render to humanity. But they owe it to humanity to make known the facts of their profession—to enlighten people as to its service and its necessity.

Isn't it reasonable to believe that one out of every six who now neglect their teeth can be awakened to the need and necessity for proper care through educational publicity? This would mean 100 additional patients for every dental practitioner. The average dentist has an annual gross income of about $5,000. With 67,000 dentists in

cosmetics, jewelry, etc. People will spend more for dentistry and more people will go to the dentist when dentists employ the power of the printed word to inform and advise them of the dangers of neglected teeth and the advantages of proper dental care.

In order to safeguard all local societies in their use of publicity of the right kind, the American Dental Association appointed a committee to examine and approve all publicity to be used. In this way, local societies are protected against the use of the wrong type of publicity, that is, publicity that they should not use.

After all, this activity is public service of the highest order.

You now have the commercial viewpoint. My answer to the question of

motive, and I wish to be quite emphatic, is that I believe the primary thought in the majority of the minds of the men in the profession — those connected with organized dentistry and otherwise in ethical practice—is the minimizing of dental disease and improvement in the health of the people of this nation, but not by high-powered methods of salesmanship. I take strong exception to the statement of any man or group of men who would place our motive on any other basis, and any program of oral health projected primarily with the idea that it will bring work to the dentist is destined to fail. It must be based on the great principle that humanity will be benefited in such a way that, over the years, the health of our patients will be preserved, or restored when necessary, from a dental standpoint, and that relief from pain may be given to children and adults, as well as infection eliminated which otherwise would retard normal development. How then, you ask, would you enlighten the public? I say not by paid advertisements—a hundred times, no—because that means an immediate lowering of standards. It can be done in a professional manner, in such a way as not to reflect on the profession, through the medium of the dental office, the schools, the medical profession, health departments, health agencies, school boards, the press and the radio, if thought advisable, in some communities. I will be more specific later. Incidentally, does the dentist benefit financially by this impersonal educational work? Yes, and no, for while patients must necessarily seek the services of the dentist in order to correct dental defects, if informed they would do so in time to prevent the great inroads of decay or development of infection. If these conservative educational methods should cease, it would mean a vast retrenchment in preventive measures, the result being an increase in dental disease and the involvement of the general health of the people. Not only would the menance to the health of the nation be greatly increased, but the additional reconstruction work necessary in the way of artificial dentures, bridges and fillings would be beyond my ability to estimate. It is my understanding that from $15,000,000 to $20,000,000 worth of gold is used in the United States per year for dental work, and I venture to say that this total would be materially increased in the event the dental profession gave up its campaign for preventive dentistry. It is realized that this depression has caused a tendency to loss of balance, and, in certain parts of the country, a clamor has arisen for radical methods as far as publicity is concerned, but fortunately the men at the helm are alive to the situation, with their feet on the ground, in the realization that this artificial state in which America finds itself will soon pass, and with the improvement in conditions in general, the tendency toward radicalism will disappear.

It is now pertinent to consider the character of the material which should be issued and the method of disseminating it. This committee of the Board of Trustees presented a preliminary report last February at a meeting of the Board, in which it recommended that all dental educational material issued by the A. D. A. be prepared in the Bureau of Public Relations, which is the agency created for this purpose, and not by a committee located outside of Chicago, far removed from the library and other sources of information in the Association, and subject to change from year to year. As a matter of fact, most of the educational work of the Association is being done, and has been done in

the past, by this bureau. The committee further recommended that the bureau consult with the various affiliated groups in the profession, such as the International Association of Dental Research, the Academy of Periodontology and the American Society of Orthodontists, having the material further passed upon by the Committee on Dental Health Education of the A. D. A., and finally endorsed by the U. S. Public Health Service. This last measure, the committee felt, would be an excellent thing for dentistry, it being obvious that the approval of this important branch of the U. S. Government on the educational matter would be official, meaning a great deal to the average layman and taking from the material any possibility of an approach toward advertising or propaganda. With this idea in mind, it was suggested to Dr. Dittmar that a conference in Washington with the Surgeon General would be vital to the success of the program. Shortly thereafter, the conference was held, first with the Assistant Surgeon General in charge of publicity and later with Hugh S. Cumming, Surgeon General. Surgeon General Cumming was very much interested in the matter, gave his general approval and delegated Clinton T. Messner, Chief Dental Surgeon of the Service, to our committee for such assistance as it might desire. (Incidentally, Dr. Messner has already given invaluable aid to the committee.) Briefly, the plan is to have dental health articles, and other material, prepared somewhat as outlined above, endorsed by the U. S. Public Health Service, and sent to state and component societies, which, if they desire, could subsequently obtain the endorsement of their respective state, city and county health officers. This would so authenticate the material that it would be of great interest to the public and in demand by newspapers throughout the country. It is felt that this would supply a need felt by many dental societies, and if the proper approach by a carefully selected committee is made to the editors of the important newspapers in various communities, no difficulty will be experienced in having them published. I have prepared here, as shown below, a sketch embodying, in general, the set-up our committee has tentatively in mind, the title "Mouth Health" and some of the subject matter, having been used by the Minneapolis Dental Society in a series of articles prepared in 1924. (See accompanying figure.)

You will note that it carries none of the flamboyant aspect of the commercialized articles exhibited here. Certain members of the committee do not like the word "mouth" as outlined in the first heading, as it seems to be somewhat repugnant to laymen. In presenting this today, I am doing so only in a most tentative way because it is felt that some such title as "Dentistry and the Public Health" would be more desirable. After all, the term "Dentistry" is known from one end of the world to the other, and while some may feel that it has a restricted use, every operation in the mouth can be classified under it. Also it is an excellent idea to connect our profession in this way directly with the health of the nation.

The commercialized material is a direct appeal to the public to have dental work performed, its purpose so obvious that any man having pride in his profession would unquestionably recoil at the sight of it in his local papers, and be under the necessity for apologizing to his patients whenever they mentioned it. In the city of Washington alone, the publication of this material once a week for twenty-six weeks would have cost $6,000 or $7,000—a straight advertising

project for profit; but profit for whom? On the other hand, it is felt that material similar to that suggested could be published in the newspapers, presented over the radio and employed in the schools and before parent-teacher and citizens' associations without the criticism that it is unprofessional or is propaganda. It will be material well written, embodying information of real value to the public and having no direct appeal to the public to visit the dentist.

The committee believes that most valuable work in the education of the public can be performed through the medium of the public and private schools, because it is here that the seed of preventive dentistry can be planted to the greatest advantage to the individual and the nation. Similar material prepared and authenticated all along the line, as indicated above, could eventually be sent to all boards of education, public and private schools, health departments and health agencies of all kinds, especially bodies caring for children, and if this work is thoroughly done, most of the education problem is solved. It is well to keep the adult population informed on the trend of dental progress and as a reminder lest they procrastinate too long. Another most effective method of educating the public is through the physician, and I cannot emphasize too strongly the value to the public health of the relationship existing in recent years between the medical and dental professions. It is well that meetings having both physicians and dentists on the program be encouraged.

In closing, let me say that this plan for the dissemination of educational material will not necessarily affect local programs, but is suggested in order to strengthen them. It is felt that rather than criticize the action of a local society in promoting educational work in a certain manner, it is preferable to attempt to outline a better mode of procedure. Criticism is futile unless it is constructive and has something to offer in substitution of the thing criticized. The rank and file of the profession want action, but only such action as is based on the rock of the Code of Ethics, embodying fundamentally the principles laid down by those grand old history makers of another day.

IS LACK OF MONEY THE FUNDAMENTAL CAUSE OF NEGLECT OF THE TEETH AND THE GENERAL HEALTH?

By PAUL F. O'BRIEN, D.D.S., St. Louis, Mo.

BECAUSE the people of our nation buy medical care so reluctantly, the Committee on the Cost of Medical Care, the public and certain members of the medical and of the dental profession apparently have concluded that most persons are financially able to pay for their own food, clothing, shelter, automobiles, radios, cigarets, cosmetics, recreations, amusements; in fact, every necessity and luxury except medical care.

It is indeed unfortunate and regrettable that our economic scheme fails to

be complete by just such a narrow margin. It failed by the same narrow margin before the radio became known; before the automobile became indispensable; before the use of cosmetics became fashionable; before golf became universal, and before taxes became oppressive. It will continue to fail by the same narrow margin after countless new necessities and luxuries are added to the list. In fact, it will always fail—as long as the "flesh is **weak.**"

The American people always manage to find the necessary money with which to buy what they really want. Few of them, even those possessing unlimited wealth, really want medical attention until pain, an impaired function, a systemic disturbance or a loss in personal appearance threatens or occurs. Not many seek medical care for the single reason that they have the necessary money. Conversely, not many fail to seek that care for the single reason that they lack the necessary money. On the other hand, individuals who possess a discriminating sense of values seldom fail to seek and accept treatment, regardless of their financial status.

The truth of the matter is that lack of money is but a minor rather than the major cause of neglect. The principal causes, in the order of their importance, are: 1. A confused sense of values, which prompts the selection of things that are pleasant, popular and impressive. 2. The tendency of human beings to follow the line of least resistance, which induces procrastination, carelessness and a dependence on nature to take care of things. 3. Fear of pain and a disinclination to be made uncomfortable, even temporarily. 4. Lack of money. 5. Disappointment in previous service.

If lack of money were the major cause of neglect, the outlook would indeed be discouraging. Since a confused sense of values is mainly responsible, there is hope; for it is possible through education to set such a confused sense in order. It is undoubtedly true that families of a high financial status receive more medical attention than do those of a lower status. This is mainly due to the fact that the former are better educated and consequently possess a more discriminating sense of values than the latter. Thus, the part that money plays is more or less indirect, as it facilitates the acquiring of an education, which, in turn, improves the ability to gage values, which, again, prompts the selection and acceptance of necessities and luxuries in proportion to their relative importance.

When human beings become sufficiently well educated to recognize values in their true perspective, and acquire the self-control, courage and strength of character necessary to accept them accordingly, then and then only will they seek health above all else, and welcome with fortitude the physical and financial sacrifice which they entail. That mankind has not yet reached this plane is no fault of the medical profession. For the profession to lower its ideals to conform to the present level of human weakness would retard not only medical, but also all human progress. It is the duty of the profession to mold, not echo, public opinion.

It has been said that the present business dislocation places the financial responsibility of the public's dental care squarely on the dental profession. Does this dislocation place the financial responsibility of feeding, clothing, and sheltering the destitute on the respective distributors of these commodities? Does it place the responsibility of providing every family with an automobile on the

automobile distributor? Does it place the responsibility of supplying every youth with cigarets and every girl with cosmetics on the dispenser of these luxuries? Emphatically, it does not. Nor is there any need for the dental profession to egotistically claim or assume responsibilities that by common consent rightly belong to the public. The profession has conformed to the general trend throughout the present emergency by accepting fee reductions and credit impositions shoulder to shoulder with business.

It has been said that dentistry so vitally concerns the health of the nation that federal, state or local governments should provide it for the people. If it is agreed that dentistry is essential to health, it must be agreed that wholesome food, adequate clothing and sanitary housing are also essential. Hence, it would be inconsistent for the state to provide the one and not the other, and would constitute occupational discrimination. Dentistry is not a business, but a profession, with ideals above mere monetary gain. The perpetuity of these ideals depends on a maintained equality with business in economic opportunity. An impoverished and debt-harassed professional man may be a serious menace to society. No dentist can long escape this impoverishment if, during twenty-nine days of the month, he must treat pyorrhea pockets in a "Utopia" where other pockets have been purposely emptied, and, on the thirtieth day, descend from the clouds to discharge his own obligations in a world where "business is business."

During a business reaction such as the world is now experiencing, various agencies endeavor to provide the destitute temporarily with the essentials of life. Neither these agencies, nor the government, nor insurance companies presume to support the people permanently from funds obtained through general subscription, taxation or insurance premiums. Why? Because it is realized that every family requires a definite quantity of food, clothing and other essentials. This fact automatically precludes the possibility of successful insurance exploitation, as no family would buy the insurance unless the premium cost were less than the family's known cost of living. In other words, the public and the insurance companies recognize the universal need of these commodities, and therefore the impossibility that the law of averages could function in favor of an insurer. What they have not yet recognized is the universal need of dental service. This need is so prevalent that a voluntary self-supporting dental service insurance plan cannot succeed for the same reason that family maintenance insurance cannot. Even life insurance could not succeed if human beings died again and again, during what is now considered the ordinary span of life.

Compulsory dental insurance may give the insurance company, or the state, the opportunity to collect more from one subscriber than the value of the service rendered him, in order to provide service of greater value to another than the cost to him—an inequitable plan, depending for success on the possibility that many would not need treatment, or would neglect to apply for it. If all those who needed treatment applied for it, the maximum premium rate that could feasibly be charged would prove insufficient to provide prophylactic treatment and advice only, to say nothing of restorative effort. If an attempt were made to render complete service,

the cost would necessitate a prohibitively high premium rate, which would automatically exclude the poor, the extravagant, the financially careless and the incompetent. Who would pay their premium charge? The taxpayers, when the need now is for reduced rather than increased taxes? What agency would determine when an individual or family was unavoidably indigent, was concealing assets, was needlessly extravagant, careless, or luxury-bent? Would taxpayers be expected to pay for private incompetence, or would the burden fall on those adjudged able to pay? What about the administrative cost?

Since the ultimate purpose of any plan is to provide service for the "80 per cent who now fail to receive treatment," and since a confused sense of values is mainly responsible for this failure, the insurance plan, to succeed, must either set this confused sense in order, or be made compulsory physically as well as financially, since many would rather pay for and not submit to treatment, than submit to free treatment. To force the people of our nation to buy insurance that many would not want or use, and to force them to submit to professional treatment against their wills, is unthinkable, impractical and doomed to failure.

Insurance companies cannot be blamed for trying, as it is their business to be ambitious. Many of them, though probably in need of new fields to develop, are, no doubt, sincere in their efforts. The public, at the moment, would offer a fertile field, as it is in a receptive mood to embrace any promised panacea. The dental profession alone of the parties involved is in a position to clearly understand most of the issues. It should recognize the duty and privilege of supplying the necessary leadership to save itself and the public from exploitation.

The public has no justifiable quarrel with the profession. Dentistry has been no fly-by-night confidence game that needs to apologize for its conduct; that needs to blush at its record; that needs to stampede in retreat at the first short-sighted, unfair accusation; or that needs to answer for a world-wide business upheaval for which it has not been responsible. The profession has become what it is today as a result of painstaking effort, attention to detail, the exercise of judgment and adherence to high ideals. Its status is not the result of accident or subterfuge. Its economic precepts, although not perfect, have evolved throughout the years, by trial and error, as the most equitable possible under the prevailing individualistic system of economics.

As long as this individualistic system survives, the public no more needs socialized, insurance, panel or group dental service than it needs socialized, insurance, panel or group distribution of other essentials. Why not socialize or group all business and all occupations? Why strangle the one and exempt the other? Let us become a socialized nation and then there will at least be a common standard to which all may adapt themselves.

This socialization is perhaps in the offing. It is approaching in direct ratio to the standardization of individuals. Successful socialism depends on the equality, or near equality, of individuals in fact as well as in name. The noted biologist, Dr. Davenport, quotes, "One thousand graduates of our best universities, at their present birth rate, will have only fifty descendants after six generations; while on the other hand one thousand unskilled laborers will have

one hundred thousand descendants, at the end of the same period."

If this is true, our best brains will undoubtedly disappear in time, and those remaining will level off to equality. Our only chance to escape the slough of socialism is to increase the birth rate of individuals with intelligence, with culture, with initiative, with individualism, with pride in achievement, with strength of character and purpose, with energy and industry and with love for the game of life.

If this is not done, these characteristics will eventually disappear and everyone will become equally inefficient and incapable; individual effort will become useless, and socialism or any other "ism" that offers a reward without regard for effort, merit or achievement will become acceptable to all. The principal reason that some are clamoring for socialized "this" and socialized "that" is that the number of individuals unfit to survive the competitive battle of life is gradually increasing. Perhaps this is also the reason that some professional men favor socialized health service.

The blame for most failures to survive in any occupation is due directly to the unsuitability of an individual to his occupation. More deliberate and scientific selection of an occupation should be made. More thorough and intense training and less sentiment in educational methods are also indicated, in order to discover and discourage the inept.

Group dental practice has been suggested as a possible means of reducing the cost of dental service to the patient. Its exponents have thus far only generalized. A few of the most obvious questions still unanswered are:

1. Will not the rivalry between the various groups become so intense, as in the case of big business, that more and more pretentious offices will seem necessary?

2. Will not this cause either an increase in cost to the patient or bankruptcy for the group?

3. Is it possible for group practice to materially reduce the cost to the patient?

4. Will not the "organization" expense counter-balance any possible economy in equipment, rent, etc.?

5. Will it be possible to assemble one real executive and two, three, four, five or ten "yes" men under one group?

6. Can two, three, four, five or ten men of near equal executive ability work and make decisions in harmony?

7. Will one man own the establishment and employ the others?

8. Will not the matter of equitable compensation be difficult, almost impossible, since no two men can produce identical dental work?

9. Will not an equitable classification of the various specialties be almost an impossibility?

10. What about the relative value of personalities in professional activities?

11. Will a dentist working for a wage give his best? Will he have the motive to do so, indefinitely?

12. If group practice can now be successful, why has the association of dentists during the past not been more successful?

13. If there is a real need for group practice, why has it not evolved automatically, step by step, throughout the years as most changes do that are really needed, without forced planning?

14. Will group practice correct the public's confused sense of values, check its tendency to follow the line of least resistance or help it to overcome the fear of pain?

No doubt, there are some advantages to be gained through group practice, but until its practicability can be satisfac-

torily demonstrated, there is need for not only caution, but also suspicion.

The key to the situation is not money, but education. The lock is human behavior. Neither professional services at cost nor professional services gratis can improve human habit or attitude. Education can. A reduction of 20, 30, 50, or 80 per cent in dental fees would not help the public to recognize the value of dental service. Such action would only suggest that dental service had decreased in value, had become less needed or less desirable. Education is the only agency that can successfully promote public health consciousness. The insurance, group, panel, socialized or what have you, plans cannot succeed without education, even though they could materially reduce the cost to the patient. Since all plans depend on education for success, why change plans? Why not try education?

It is time that organized dentistry do its own educating. It is time to tell the public who, what and why organized dentistry is today. If its ideals are as worthy and as unselfish as it professes to itself, behind closed doors, what is there to be ashamed of? Why all the secrecy? Dentistry certainly has no skeleton in its cabinet. It is time to publicly introduce good dentistry to the public. It is time to publicly demonstrate just what a good amalgam restoration is, and what can be expected of it; what a good inlay is; what a surgically clean extraction is; what is considered a good artificial denture. It is time to talk technic; to talk comparative values in the language that people understand. It is time to publicly demonstrate that a $10 per week youth who drives an automobile, takes his girl to the show three times a week, smokes cigarets and frequents night clubs cannot reasonably expect the profession to serve him at its expense. It is time to demonstrate that dentistry is all "hand work" and that it does not pretend to compete with mass machine production. It is time to forget our superdelicate and superprofessional dignity a bit and prove that our fees have been, and are now, equitable. In this day and age, there should be no subterfuge, no timidity of purpose, no hesitancy or secrecy. If the profession is on trial, let all the evidence be presented. It cannot hope to prosper without favorable public opinion. It has lost a portion of that favor through overconfidence in an antiquated professional prestige, in a world that eats, drinks and sleeps to the dictation of radio, billboard, newspaper and magazine. It is time to modernize the public's opinion of dentistry. This cannot be done until the profession "perpendicularizes" its backbone a bit.

The need of the hour calls for a dissemination of the truth—the unmitigated truth—not whispered from the cellars, as in the past, but unequivocally shouted from the housetops.

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C. N. JOHNSON, Editor

NEWTON G. THOMAS, Associate Editor

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Editorials

A QUERY

At the meeting of the Seventy-Fifth Annual Session of the American Dental Association in conjunction with the Chicago Centennial Dental Congress, Dr. C. E. Rudolph, of Minneapolis, read a paper entitled "Trends in Dental Practice." In the regular order of procedure this paper was turned over to THE JOURNAL for publication.

On examining the manuscript of the paper, the Editor of THE JOURNAL felt that it merited more than the ordinary attention, and accordingly he wrote an editorial on the subject intending to publish it in the same issue in which Dr. Rudolph's paper appeared. In the September issue of *Dental Survey,* the gist of Dr. Rudolph's paper appears embellished with illustrations, and headed by the statement: *"Dental Survey* presents here excerpts from a stenographic report of an important address given by Dr. Rudolph before the General Assembly of the Centennial Dental Congress in

Chicago. Dr. Rudolph, member of the Committee on the Costs of Medical Care, knows what he is talking about and has some significant things to say."

Of course, we cannot publish this address in THE JOURNAL after its appearance in another publication, but we herewith append the editorial we had written and we have a query to make. Under what authority was a stenographer admitted to this meeting, other than the official reporter?

The Editor of *Dental Survey* has been good enough to write the following explanation, which we are glad to reproduce:

APOLOGIA

In the absence of the editor on his vacation during August, a very regrettable error occurred in the make-up of the September issue.

One of the editorial staff in preparing a report of Dr. C. E. Rudolph's paper read at the Chicago meeting, instead of preparing a brief abstract as planned, elaborated too extensively on it, thus overstepping the right of any publication other than the *Journal of the American Dental Association* to priority in publishing material appearing on the program of the national meeting.

In spite of all precautions taken to prevent mistakes of this kind, it seems they will happen at most inopportune times.

Dental Survey is conscious of and expresses its sincerest regrets, and offers apologies to the *Journal of the American Dental Association,* and to Dr. Rudolph, for the annoyance this seeming breach of faith caused them.

As the editor of *Dental Survey* has just intimated, mistakes will happen, and we are inclined to accept his explanation at its face value. Whoever committed the breach should be made to realize that it was a breach, and it is hoped that on future occasions greater regard will be had for the rights of officials who conduct these meetings. Further comment would not add clarity to the situation, and we accordingly close the case and proceed with the publication of the editorial we had prepared before the *Dental Survey* for September appeared.

THE GREAT "UNTOUCHABLES"

In recent years, our profession has been stirred to its very depths by emphasis on the spectacle of the vast numbers of our citizens who are in need of dental service but are not receiving it. It may be well to go at once to the meat of the matter and raise the question as to why they are not receiving it. Without peradventure of a

doubt, there are many who, during the period of the recent prevalent financial *impasse,* have found themselves minus the wherewithal to pay for adequate dental service, but that is not by any means the whole story or the most significant story. There is something deeper than the depression to account for the fact that so many of our citizens, worthy and unworthy, are going through life without the undoubted benefits of dental care.

It would certainly not be politic, nor would it in every case be quite fair, to intimate that with very many of them the fault is their own, but when these same citizens continue to go without adequate professional service and spend many more times the amount that would be required to give them that service on such nonessentials as cosmetics, chewing gum, candy, cigarets and more than worthless liquor, we may be pardoned for finding it somewhat difficult to strain our sympathies too far in contemplation of a neglected humanity.

We are not declaiming against any of the indulgences just referred to, nor do we charge all of the dental neglect to these agencies, but the fact remains that many of those who are in need of professional service have the means of securing it, but they do not realize its importance as against many of the other attractions of life that make to them a more powerful appeal. We all know that too many people will quibble over a just fee for professional service, and at the same time distribute their money lavishly for the nonessentials of life. It is all a matter of education and inclination. Too few are educated to the needs of professional care, and too many are inclined to gratify their desires and indulge their fancies. What is to be done about it? With all of this, there are also those who do not squander their money, yet are in need of the real essentials of good living, and it is to these that our greatest solicitation goes out.

In a paper entitled "Trends in the Practice of Dentistry" read by C. E. Rudolph, at the Seventy-Fifth Annual Session of the American Dental Association in conjunction with the Chicago Centennial Dental Congress, a laudable attempt is made to throw light on the situation. It is not so much a matter of concern as to whether

we may agree fully with all that Dr. Rudolph has said, as it is that honest men are trying faithfully to fathom the problem and seek a solution. With much that Dr. Rudolph has said, we are in the fullest accord, and we are gratified that he is bending his best energies, in common with other good men, to throw light on the subject.

In one place, he says: "We must look toward the future with an eventual eye to stabilizing dental practice at the highest possible level of scientific, ethical and economic efficiency. It is not a job for this year or next, but rather an aim and a goal for many years to come. We cannot claim to have reached this goal until we have provided adequate dental care for every man, woman and child in the country."

Dr. Rudolph also says: "Whatever form the demand for increased dental service takes, the supply of that service must be regulated and controlled by the dental profession." Amen and absolutely! This is the one provision for which every honest and far-seeing man in the profession must irrevocably stand.

In another place, Dr. Rudolph refers to Mahatma Gandhi and his sacrifice for the "untouchables" of India, in connection with which he says: "But America has its 'untouchables' too. Dentistry has its 'untouchables.' Under the present economic organization of dental services in America, there live some fifty-five to ninety million souls who have never been touched—professionally—by a dentist."

This is the one theme on which many worthy people have spent their energy and lavished their sympathies, the great untouchables of dental neglect. Let us see. In the first place, no one has yet been able to prove that the percentage is correct when these statements are made, even with the very liberal range of fifty-five to ninety. But granted that this great "untouched market" does exist, how are we to remedy the situation?

Pathetic as the picture may be, we are never going to blot it out by the biggest brush that ever was wielded called "socialized dentistry." We shall never wave a socialized wand over the great mass of dental untouchables, and hear the refrain, "lo and behold they came forth purified and purged of their dental ailments." Real

evolution does not work that way, neither does real progress. For one reason, it does not work that way because human nature will not permit it.

What percentage of the "fifty-five to ninety million" would ever avail themselves of the undoubted benefits of adequate dental care, even to the extent of sacrificing the most meager minimum amount estimated as necessary to provide for dental service? And please remember that unless the untouched are willing to sacrifice something to be made dentally clean, the case to that extent is hopeless. We have all seen only too clearly in recent years—in fact we have always seen—the evils of gratuitous service, aside from the care of children or the aged and helpless. Gratuitous service is demoralizing in every way, most of all to the recipients of the service. Unless those in need of dental service are willing to sacrifice something for that service, the dental millennium as pictured by some of our goodhearted but impractical philanthropists will never arrive. Giving free dental service to the people is not the solution of the situation, neither is having it delivered free to the people and paid for by the state. As already indicated, many of our untouchables, as is also the case in India, refuse to be touched, and till education comes to their aid and they see the light, there is little prospect of their redemption.

An old adage says: "You can lead a horse to water but you cannot make him drink." In this instance, the adage needs modification to adequately meet the situation—there are some horses that you cannot even lead to water.

SURVEY OF DENTAL NEEDS

Those who attended the August meeting in Chicago no doubt read the annual report of the Committee for Dental Health Survey presented by the Chairman, Dr. C. T. Messner. This report told of the organization of the committee and of the survey of existing dental health facilities that is being made under its jurisdiction.

Editorial notice was given to this enterprise in the April, 1933,

issue of THE JOURNAL, and since that time encouraging progress has been made toward the consummation of the plan.

The House of Delegates in Chicago added another very important duty to those of this committee by instructing it to make a "survey to determine the dental needs throughout the United States (this survey to be confined to kindergarten and grade school children, and selected adult groups in institutions where practicable)."

Immediately after the Chicago meeting, plans for the organization to conduct this all important nationwide survey were formulated. Owing to the fact that the Public Health Service is lending its facilities in helping to complete this survey before the end of the present school year, it seems quite probable that, by next spring, we shall have a true picture of the dental needs of school children throughout the entire United States.

The examination blanks have now been completed, and these, as well as printed instructions and tentative suggestions for organization, have been sent to the secretary of each state dental society with the request that the state societies cooperate in making this survey.

This study of dental needs has been endorsed by the American Dental Association, the U. S. Public Health Service, the Association of State and Provincial Health Authorities, of which every state commissioner of health is a member, many state commissioners of education, and others.

If the state, component and local dental societies will earnestly cooperate in this survey, each state and local society taking part will know the true dental condition of the school children in their jurisdiction and will undoubtedly bring to the attention of the local community, the child and the parents, the need for dental attention. It is suggested that as the survey is made by members of the local dental society, a postal card be mailed to the parents of each child who is found to need dental treatment, calling their attention to this fact. This is at the same time an obligation that is due to the citizen, as well as a perfectly legitimate type of propaganda that must ultimately greatly benefit the profession through the medium of increased dental service.

All of the necessary forms for making this survey will be furnished by the Public Health Service with the exception of the card to be sent by the local society or teacher to the parents.

The chairman of the committee informs us that, on October 15, sixteen states had already volunteered to make this survey, either entirely throughout the state or by certain specified local societies representing rural, urban, industrial or mining communities. In some states, the state secretary is supervising the survey throughout the state; in others, the state mouth hygiene committee. In those state departments of health where there is a full-time dentist on duty, it is often being delegated to him. Naturally, so large an undertaking as a nation-wide survey must be supervised by some responsible person or committee in each state, in order that proper attention can be given to local conditions.

An important fact in connection with this survey to determine dental needs is that it is being made by dentists, members of the American Dental Association, through their local, district and state societies. It is actually being supervised by the U. S. Public Health Service in cooperation with the American Dental Association and the Association of State and Provincial Health Authorities. It is hoped that every state society will cooperate to the extent of its ability, either by organizing a state-wide survey or by selecting and organizing certain communities in its jurisdiction in order that all parts of the country may be included in this survey.

When the survey is completed, the information obtained will be made available as soon as possible, and it is hoped that the American Dental Association will be able to recommend some definite policy for dental health education and dental care.

The American Dental Association owes a debt of gratitude to Surgeon General Hugh S. Cumming of the U. S. Public Health Service for his able support. He has always been most cooperative in any enterprise having to do with the welfare of the profession or the public at large. We urge organized dentistry "to do its part" to carry out this important study.

MILLER, WILLIAMS AND BLACK: A DENTAL TRILOGY

Probably a profound sentiment and a touch of artfulness were combined in devoting one room in a host ridden convention to a memory. Suggestively enough, it was never crowded. For indefinite periods, it was empty save for the guardian of its treasures. Many entered it to explore, not knowing before time what it contained. Such removed their hats and spoke softly. There were no chairs to foster complacency or encourage the gregarious. No one raised his voice to get the attention of those who came. There was no dissertation, no exhortation, nothing to sell. And yet that room contained more of value than any other used in the convention. It said more than the tongues of the scores who essayed to teach, impressed those who saw and were impressionable, beyond any demonstration made elsewhere. Around the room were mementos of the genius of Miller, Williams and Black.

One looked at the relics in silent veneration. They were not to be touched, but no label was necessary to warn hands away. Those things were stimulants for the hearts and minds of their observers. How far-reaching that stimulation might be depended wholly on the mental key of the onlooker. One thought in spite of oneself in their presence. Why were these things put on display, the names of their makers brought again to the ear? The slides, brushes, writings of Miller? The photographs, tooth forms, paintings, literature and philosophy of Williams? The multiform, multipurposed instruments, the innumerable cross-sections, the books of Black? Was it merely a gesture of esteem, a display to call for genuflections from those who professed to carry on what these men had begun? Or was there in that room an unspoken purpose too great for any living voice to convey, a necessary lesson that no living man would dare?

The times in which these men wrought made one ponder. America was in the rough when Black was born. The date lacks only three years of being a century ago. Lincoln was still a youth. The

continent boasted only 40 miles of railroad. Chicago was a hamlet of log houses with a population of 400, three years before. One year after, it claimed 4,000 and became a city. Greene Vardiman Black was 16 before a railroad came to the state. At the time of his birth, Virchow was 15, Pasteur was 16, Lister was 9. Koch, Ehrlich and Metchnikoff had not yet appeared. Williams and Miller came upon the scene sixteen and seventeen years later.

One's mind wandered from names and dates to the great assertions that constitute the alphabet of modern biology. Mendel's peas had not broken their pods to disclose their stories of heredity in '36. Darwin and Wallace had not surprised the world with their coincident Origin of Species. The cell of Hooker had not been announced as the anatomic and physiologic unit of structure. Bacteria as the cause of disease were unheard of. *Omnis cellula e cellula* had not been formulated. Koch's laws were yet to come. A leukocyte had never been seen. Histology as a science was unborn.

What dentistry was extant was manual and mechanical in the crudest way. Vulcanite was unknown, likewise were rubber dam and cohesive gold. Nitrous oxide as an anesthetic came eight years later. There was no dental society in America, no dental school, no periodical. It is no wonder that Miller sought companionship and atmosphere for his researches in Europe or that Williams divided his time between England and America in pursuit of his studies. Oppositely, there is something fascinating in the courage of the man who staid on the prairie where he was born and wrought alone. Miller will live immortally with Virchow and Koch as a bacteriologist. Williams, the histologist, artist and literateur, made his place undisputed in that galaxy of the great. But it was Black who underwrote dentistry as science and art, combining in himself the master clinician and master investigator, making with his own hands instruments to meet his need and deducing from life and laboratory in unison the basic truths of dental service. When one compares their times and ours, these men stand like lone unapproachable peaks upon a vast plain.

Obviously, the men did not work under the pressures of today. They did not have around them the atmospheric urge that is felt

now. Research was not a commercial-like brand that was advertised by placard and insignia worn on lapel and chain. Their motive was intragenetic, not extragenetic. Ink and more ink was not their motto. Saying nothing gracefully or otherwise was not their objective. But to say something that they knew to be true, something that they had determined beyond dispute! Research, quest for truth, for basic principles in health and disease was a patient passion. Black taking time to make a machine, delaying his problem for tiring months that what he did might be irrevocably done, gives definition of both patience and passion. It is vain to speculate on what these men would have thought of our research tempo, whether our nervous jargon would have chilled them or thrilled them. Verbally, they remain silent. Only their works speak.

We would avoid ancestor worship, but not the tribute that grew in the silence of that room. Before us were the eloquent reminders of foundations laid as real research should lay them. In their patience, their tireless effort, their devotion to truth, those men set at the very beginning of our professional life an example that is fadeless and imperishable. It would seem that no better preparation could be had for one pledged to this purpose than a study of their lives and manner of work. One wondered if this was the unspoken motive that prompted the display of that trilogy of dental inspiration.

T.

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The following is a continuation of Accepted Dental Remedies. The Council will appreciate constructive criticism which will aid in future revisions of the material.

SAMUEL M. GORDON, *Secretary.*

CALCIUM COMPOUNDS

Most of the calcium in the body is combined as phosphate and carbonate to form the inorganic structure of the bones and teeth. That present in the remaining tissues is not more than 1 per cent of the total, but the normal functioning of nervous muscular and glandular tissues is dependent on this concentration. In health the calcium of blood plasma is maintained at 10 gm. per hundred cubic centimeters. Tetany may result if the blood plasma calcium drops to 7 mg. per hundred cubic centimeters. Soluble calcium salts are important constituents of most "Ringer's solutions."

Calcium deposition in the body is dependent on an adequate supply of both calcium and vitamin D, and may be related to the functioning of the parathyroid gland. The results of balance experiments indicate that the minimal requirements of calcium for a normal adult is about 0.5 gm. of calcium per day and double this quantity represents a safe margin. (Sherman, H, C.: *J. Biol. Chem.,* 44:21, 1920.) The average normal diet usually supplies sufficient calcium, but when unusual diets are taken, there may be a calcium deficiency. This may be remedied by the administration of natural foods having a high calcium content, such as milk, green vegetables and egg yolks. Vitamin A and C are also claimed to be necessary for proper calcification of teeth. Dietary experiments in respect to dental therapeutics are still in a state of flux, and much more of a definite nature will have to be done in order to make the application of dietary methods useful in routine dental practice. (Diet and Teeth, Report of the Council, *J.A.D.A.,* 19:1843, 1932.)

The administration of special preparations of calcium salts is indicated only in pathologic conditions, especially tetany. Administration of calcium salts by mouth in this condition results in a temporary increase in the blood calcium and cessation of the symptoms, but unless the cause of the condition is removed, the concentration sinks rapidly after discontinuance of the calcium administration. Administration of parathyroid extract leads to temporary increase in the blood calcium even though some form of calcium is not supplied. In rickets, osteomalacia and caries, there is a defective deposition of calcium in the bones and teeth, but this may be due to factors other than a calcium deficiency. These conditions are not benefited by the administration of calcium salts except in rare experimental conditions when calcium has been almost totally lacking in the diet. It may be used as an adjunct in the diet when a source of vitamin D is supplied. Some observers believe that a diet high in calcium may exert a beneficial prophylactic effect. (*J.A.M.A.,* 95:1977, 1930.) Boyd and Drain and others have intimated that caries might be arrested by a diet high in "mineral salts" and adequate amounts of vitamins A, C and D.

The apparent close relationship between deficient diets and abnormal development of dental structures suggests that the physician and dentist should cooperate in the matter of prescribing diets to patients. It should always be borne in mind that the teeth are just one part of the human economy, and that diets advised for the correction of dental disorders may exert an undesirable influence on other parts of the body. More definite data on such feeding experiments are needed.

Caries and pyorrhea alveolaris have been ascribed by some investigators to an inherent

defect of calcium metabolism, but until more satisfactory evidence is available, no reliable conclusion regarding treatment can be drawn.

A parathyroid deficiency in infants may result in an abnormal delayed eruption of teeth and may lead to other dental abnormalities of an orthodontic nature.

Erdheim has demonstrated that parathyroidectomy in rats leads to retardation of calcification of the dentinal layers. These experimental observations have not found application in therapy. The Council strongly recommends that in the present state of knowledge concerning the relationship of calcium metabolism to parathyroid function, cases wherein parathyroid administration is indicated should be referred to competent physicians for cooperative treatment.

Calcium is necessary for the coagulation of the blood. Calcium salts have therefore been administered in hemorrhagic conditions such as hemophilia and purpura; but since these conditions are not due to a deficiency of calcium, the added calcium has no effect. The internal administration of calcium for hemorrhages in the oral cavity appears irrational for the same reason, although exodontists and other surgeons prescribe calcium lactate or some other form of calcium prior to extraction in those suspected of slow coagulation time. The addition of calcium to hemophilic blood *in vitro* delays rather than hastens coagulation.

Calcium salts have been administered as the chloride, nitrate, lactate and gluconate. Calcium salts of mineral acids such as the chloride when administered by mouth tend to produce acidosis because the chloride part of the molecule is absorbed but the calcium for the most part is unabsorbed. Recent experiments indicate that the gluconate is less irritating than any of the other forms.

It is, as far as experimental evidence goes, the only salt of calcium which can be injected subcutaneously or intramuscularly without causing necrosis.

Intravenous, intramuscular or subcutaneous administration of calcium salts has not been shown to be of benefit to calcification. In fact, the intravenous injection of calcium salts may be dangerous, for such injections may lead to direct depression of the heart and death.

Soluble alkaline lime salts, such as calcium hydroxide in the form of lime water, have been used as antacids for oral hygiene purposes. Recent experimental data indicate that the lime water may dissolve gastric mucin. The application of this fact in dental prophylaxis is not yet clear.

Calcium carbonate (precipitated chalk and prepared chalk), tricalcium phosphate and monocalcium phosphate have been used as the basis of many tooth pastes and powders. Tricalcium phosphate for general use in dentifrices is regarded with suspicion until evidence regarding its effect on the mineral structure of the teeth is presented. The mechanical properties of calcium carbonate used in tooth pastes or powders are important, as a source of the product or method of preparation may yield products with different degrees of abrasiveness. Critical comparative tests of the relative abrasiveness of the abrasive and polishing agents in widely advertised tooth pastes are not readily available. It is possible that what has previously been referred to as tricalcuim phosphate used in the manufacture of dentifrices may have been pyrocalcium phosphate. If so, satisfactory evidence of the absence of marked abrasive power of tooth pastes containing tricalcium phosphate is highly desirable.

CALCIUM CARBONATE, U.S.P.—Calcii Carbonas Praecipitatus (Calc. Carb. Praec.) Precipitated Calcium Carbonate (Precipitated Chalk). Calcium carbonate $CaCO_3$, obtained by precipitating a solution of a salt of calcium by a soluble carbonate, collecting and washing the precipitate and drying.

Properties: Precipitated calcium carbonate is a fine white powder without odor or taste. It is practically insoluble in water, but dissolves to a considerable extent in water containing carbon dioxide. It is decomposed by acids, forming a salt of calcium and giving off carbon dioxide with effervescence.

Actions and Uses: Calcium carbonate neutralizes the acid of the gastric juice, calcium chloride being formed and absorbed to some extent. If the stomach contains no acid, it may escape solution and absorption. When it is absorbed, the action is that of the soluble salts of calcium which are described under "calcium chloride." The bicarbonate of the intestine tends to react with all soluble forms of calcium, so that calcium bicarbonate or carbonate may always be expected.

Calcium carbonate is used chiefly as an antacid and detergent. Biochemical evidence indi-

cates that the reaction of the saliva cannot be controlled by the administration of induced substances. For dentifrices, both the precipitated and the prepared chalk are used, although the prepared chalk is more abrasive.

Calcium carbonate is the appropriate antidote to oxalic acid as it neutralizes the acid with the formation of the insoluble oxalate of calcium. It may be used as an antidote to other corrosive acids, though magnesium oxide is preferable, as it does not yield gas on reaction with acid.

CALCIUM CHLORIDE, U.S.P.—Calcii Chloridum (Calc. Chlor.)—A hydrated form of calcium chloride containing not less than 75 per cent of $CaCl_2$.

Properties: Calcium chloride occurs as white, translucent fragments, which are odorless and have a sharp saline taste. It is very deliquescent and should be kept in well stoppered bottles. It is freely soluble in water (1:1.2), and also in alcohol (1:10).

Incompatibilities: Soluble carbonates, phosphates and sulphates produce a precipitate of the corresponding insoluble salts of calcium.

Actions and Uses: (See preceding article, "Calcium Compounds.")

Dosage: 1.0 gm. (15 grains).

CALCIUM GLUCONATE.—Normal Calcium Gluconate.—Calcium salt of hexapentol—(2, 3, 4, 5, 6)—Acid—(1)—Calcium salt of $\alpha\beta\gamma\delta\xi$ pentoxy-pentane-carbonic acid,—$[HOCH_2CH(OH)CH(OH)CH(OH)—CH(OH)COO]_2Ca.H_2O$. It contains calcium equivalent to not less than 12.40 nor more than 12.80 per cent of calcium oxide.

Actions and Uses: Calcium gluconate is used to obtain the therapeutic effects of calcium. It is more palatable than calcium chloride or lactate for oral administration. Its use in connection with otherwise ample diets has been suggested for the treatment of sensitive cervices of teeth (*J.A.D.A.*, 18:156, 1931), but this requires further confirmation.

Dosage: Orally, for adults, 5 gm. (75 grains), three times a day; for children, 2 gm. (30 grains), three times a day.

Calglucon: A proprietary name for calcium gluconate.

Manufactured by the Sandoz Chemical Works, Basle, Switzerland. (Sandoz Chemical Works, Inc., New York, distributor). U. S. Patent 1,648,368.

Tablets Calglucon: Each tablet contains 1.5 gm. (23 grains) calcium gluconate flavored with chocolate.

Calglucon Effervescent Tablets: Calglucon 4 gm. (60 grains) in an effervescent base composed of sodium bicarbonate and tartaric acid. (*J.A.D.A.*, 18:2010 [Oct.] 1931.)

CALCIUM LACTATE, U.S.P.—Calcii Lactas (Calc. Lact.) $Ca(C_3H_5O_3)_2.5H_2O$.

Properties: Calcium lactate occurs in white crystalline masses or powder, odorless and nearly tasteless. It is soluble in water (1:20), but very slightly soluble in alcohol.

Incompatibilities: Calcium lactate is incompatible with carbonates and sulphates, with which it forms insoluble calcium salts.

Actions and Uses: Calcium lactate has the pharmacologic action of other soluble calcium salts (see "calcium chloride"), but is less irritating than the chloride, and, therefore, it is suitable for injection into tissues. Large doses are diuretic.

Dosage: 1.0 gm. (15 grains).

CALCIUM OXIDE, U.S.P.—Quicklime. Calx. Lime. It contains, when freshly ignited, not less than 95 per cent of CaCO.

Properties: Calcium oxide occurs as hard, white or grayish white masses, which, in contact with the air, gradually attract moisture and carbon dioxide and fall to a white powder. It is odorless and has a caustic taste. Calcium oxide is converted into calcium hydroxide on the addition of water, and this is slightly soluble in cold water (1 in 840), less soluble in hot water and practically insoluble in alcohol.

Milk of lime is calcium hydroxide mixed with 4 parts of water.

LIME WATER.—Liquor Calcis, U.S.P.—Liquor Calcii Hydroxidi (Liq. Calc. Hydrox.). Solution of Calcium Hydroxide. A saturated aqueous solution of calcium hydroxide containing about 0.14 per cent of $Ca(OH)_2$.

Properties: Lime water is a clear colorless liquid without odor, and has an alkaline bitter taste. Lime water absorbs carbon dioxide from the air, readily forming the insoluble calcium carbonate and leaving the solution weaker in consequence. The Pharmacopeia gives a convenient method of assay, and a product which meets the pharmacopeial standard should

be insisted upon. The strength of lime water should be preserved by keeping an excess of lime in the bottom of the container. When the lime water is to be used, the clear supernatant liquid should be decanted.

Incompatibilities: Lime water is incompatible with acids and with carbonated or ordinary hard water.

Actions and Uses: Lime water is an antacid for temporary periods and a mild astringent. It is stated that lime water and dilute salt solution yield a very serviceable mouth wash for general purposes. Being a weak alkaline solution, it is especially suited for use with children. A lime water preparation for home use can be readily made by treating lime with water; and decanting the supernatant liquid (Fones, A. C.: Mouth Hygiene, Lea & Febiger, Philadelphia, 1927, pp. 291-292).

CAMPHOR, U.S.P.—Camphora (Camph.). A ketone obtained from Cinnamomum Camphora. It is dextrorotatory.

Properties: Camphor occurs as white, translucent masses of a tough consistency, having a characteristic odor and a pungent aromatic taste. It is readily pulverizable in the presence of a little alcohol, ether or chloroform. It is very slightly soluble in water (1:800), but freely soluble in alcohol, ether, chloroform and fixed and volatile oils.

Actions and Uses: Camphor stimulates the central nervous system, especially the medullary centers. In toxic doses, it produces delirium followed by unconsciousness, with epileptiform convulsions.

Camphor tends to increase the blood pressure by reflex action. The effects on animals are complex and rather inconstant. Some clinicians believe that camphor improves the pulse in impending cardiac collapse by cardiac stimulation; but more recent careful studies apparently show that it is ineffective. It is used as a circulatory and respiratory stimulant in cases of collapse, syncope, cardiac failure, etc., by hypodermic administration of a few doses of from 0.5 to 1 c.c. (8 to 15 minims) of a 10 to 20 per cent sterile solution in olive oil or almond oil injected at short intervals. Solutions in liquid petrolatum should not be used.

The weak antiseptic action of camphor is utilized in gargles and mouth washes. In combination with phenol and other members of the phenol series, it has been widely used for its antiseptic effects in root canal treatment and as sedative treatment for hyperemia, etc. Locally, it is mildly irritant. It is also locally analgesic, partly by direct action on nerves and partly by counterirritant action.

Dosage: For "collapse." By hypodermic injection, 0.5 to 1 c.c. of 10 to 20 per cent solution in olive or almond oil till the desired effect is obtained. A saturated solution in water has been used as a "mouth wash."

CHLORINATED PARAFFIN, U.S.P.—Paraffinum Chlorinatum (Paraff. Chlorinat.), Chlorcosane.

Properties: A light yellow or light amber, clear, thick, oily liquid; odorless and stable in air; insoluble in water, slightly soluble in alcohol and miscible with fat solvents.

Actions and Uses: The chlorine of chlorinated paraffin does not possess therapeutic action. Chlorinated paraffin in dentistry, as in medicine, is used as a solvent for dichloramine, which it dissolves to form up to an 8 per cent solution.

CHROMIUM TRIOXIDE, U.S.P.—Chromii Trioxidum (Chrom. Triox.) (Chromic Anhydride).—Contains not less than 95 per cent of chromium trioxide—(CrO_3).

Properties: Chromium trioxide occurs as small needle-shaped crystals or prisms of dark purplish red and of metallic luster. It is odorless, destructive to animal and vegetable tissue, deliquescent in air and very soluble in water (1:0.6).

Incompatibilities: Because of its powerful oxidizing properties, chromium trioxide should not be brought in contact with alcohol, glycerine or other oxidizable substance lest an explosion result.

Actions and Uses: In dentistry, as in medicine, chromium trioxide is used only as a caustic in the solid form or in solution up to 10 per cent. Because of its escharotic character, it should be used with extreme care; and the hard tissues should be protected by suitable means. For Vincent's infection, it is used alone or in connection with solution of hydrogen peroxide. (For a review of the drugs used in treating Vincent's infection, see Musberger, L. E.: *D. Cosmos,* 70:1029 [Oct.] 1928.)

Sodium dichromate, 5 gm., and boric acid, 4 gm., in water to make 100 c.c. has been reported as being useful for Vincent's infection. (*D. Cosmos,* 74:538 [June] 1932.) This requires further confirmation.

CODEINE, U.S.P.—Codeina (Codein.) An alkaloid obtained from opium or prepared from morphine by methylation.

Properties: Codeine occurs as colorless translucent crystals or a crystalline powder, odorless and having a faintly bitter taste. Codeine is slightly soluble in water (1:120), and freely soluble in alcohol (1:2).

Actions and Uses: Codeine is analgesic, hypnotic and sedative. Its effects resemble those of morphine, except that it is said to be less habit forming and less constipating. Its analgesic and hypnotic effects are more feeble. Continued use should be guarded against, as with morphine.

Prescriptions for codeine must conform to the provisions of the Harrison Narcotic Law. (See footnote under "cocaine.")

Dosage: 0.03 gm. (one-half grain).

CODEINE PHOSPHATE, U.S.P.—Codeinae Phosphas (Codein. Phos.)—The phosphate of the alkaloid codeine.

Properties: Codeine phosphate occurs in white, needle-shaped crystals, or as a crystalline powder. It is freely soluble in water (1:2.3) and only slightly soluble in alcohol (1:325). Codeine phosphate is preferred for hypodermic use because of its being more soluble than the sulphate.

Dosage: 0.03 gm. (one-half grain).

CODEINE SULPHATE, U.S.P.—(Codeinae Sulphas) (Codein. Sulph.)—The sulphate of the alkaloid codeine.

Properties: Codeine sulphate occurs in needle-shaped crystals, or as a crystalline powder. It is soluble in water (1:30), and very slightly soluble in alcohol (1:1,280).

Dosage: 0.03 gm. (one-half grain).

COPPER SULPHATE, U.S.P.—Cupri Sulphas (Cupr. Sulph.) (Copper Sulphate) $CuSO_4 5H_2O$.

Properties: Cupric sulphate forms large, transparent, deep-blue, odorless crystals having a nauseous metallic taste. Copper sulphate is freely soluble in water (1:2.5) but only slightly soluble in alcohol (1:500).

Incompatibilities: Cupric sulphate is incompatible with soluble salts of lead, which precipitate the insoluble sulphate of lead; with fixed alkalies and alkaline carbonates, which precipitate copper hydroxide or copper carbonate; with iodides, which form insoluble cuprous iodides with liberation of iodine; and with vegetable astringents containing tannin.

Actions and Uses: Copper sulphate, like all other metallic salts, precipitates proteins. In small doses, it is astringent; in large doses, irritant. Minute amounts have a germicidal action on algae fungi or bacteria of the colon group, but when organic matter is present, this action is greatly weakened. Its internal administration with iron, foods or other products is of questionable utility in the treatment of anemia and nutritional disorders.

Externally copper sulphate acts as an astringent, stimulant or mild caustic, this depending on the strength of application. It is claimed that application of the solid substance or of a paste in water or glycerine is useful in pyorrhea alveolaris and trench mouth.

Dosage: As a caustic, a crystal is applied or a pencil made by fusing 1 part of potassium alum and 2 parts of cupric sulphate is used.

Cupristicks, Cupric Applicators and Special Cupric Applicators (*Copper Sulphate 20-25 per cent*). Wooden sticks, 3.8, and 30.4 cm. (1½ and 12 inches) long, respectively, tipped with a mixture of copper sulphate, alum and potassium nitrate, containing from 20 to 25 per cent of copper sulphate. Each stick to be used but once; for local application.

Prepared by Tappan Zee Surgical Company, Nyack, N. Y. No U. S. patent or trademark.

Dentifrices

Dentifrices are defined as preparations (pastes, powders and liquids) which aid in the removal of débris from tooth surfaces.

Tooth pastes and powders on the market today may in general be placed in several groups or combination of groups; namely, those depending primarily on soap for their cleansing

action; those containing small amounts of organic acids; those containing magnesia magma or other alkaline substances and those containing other substance or substances, such as potassium chlorate, calcium phosphate, organic or inorganic astringents, antiseptic or germicidal substances, enzymes, etc. These substances are generally admixed with chalk for abrasive action and incorporated in paste form by glycerol (or glycerite of starch), tragacanth, acacia or other pharmaceutic binders.

Many dentifrices on the market today are unnecessarily and irrationally complex in composition. The Council desires to point out that the aims of rational therapeutics and "oral hygiene" are defeated by the use of complex mixtures, not to mention the large economic waste in the sale of highly complex mixtures when simpler combinations are just as effective. This is in keeping with the well known observation that dentifrices have no direct demonstrable therapeutic action. The sole function of a dentifrice is to aid in keeping the teeth clean by the removal of loose food débris by the mechanical use of the toothbrush.

The Council appreciates that long established customs cannot be changed at once; hence, it will, for the time being, adopt a very liberal policy in regard to the composition of dentifrices. Its labors for the near future will be directed toward a control of irresponsible claims made in dentifrice advertising; but it will apply with the greatest leniency compatible with consistency a very liberal policy regarding the composition of this class of products.

In addition to the rules of the Council, the Council has formulated certain provisions for the inclusion of dentifrices in "Accepted Dental Remedies." The provisions follow:

Dentifrices (with especial reference to those advertised to the public) may be accepted for inclusion in the list of "Accepted Dental Remedies" provided:

Claims are strictly limited to their efficacy as an aid in the hygiene of the oral cavity and particularly to their mechanical cleansing properties.

No unwarranted therapeutic, chemical or bacteriologic claims are made or inferred in their exploitation.

Therapeutically suggestive names are not used as a brand name.

The brand name is not indicative of a component which does not possess proven therapeutic properties or other inferred properties implied in the name.

There is no conflict with the rules of the Council.

The provisions in reference to proprietary names will not be retroactive.

The Council has further provided that dentifrices will be accepted for a period of one year in contrast to the usual three year acceptance clause for other classes of products to be listed in "Accepted Dental Remedies." At the end of this period, the evidence for reacceptance will be examined by the Council. If no conflicts with the rules or provisions of the Council appear, the product will be retained for a further period of one year.

ALPHA-NAPH-CO DENTAL CREAM.—Composition: Each 100 gm. contains Alpha-Naph-Co compound, 2 gm.; magnesium carbonate, 8 gm.; calcium carbonate, 46 gm.; sapo pulvis, 6 gm.; amylum, 1.5 gm.; gelatine, 0.5 gm.; glycerine, 15 gm.; water, 20 gm.; saccharine and volatile oils to flavor.

Claims: The manufacturer has agreed to make no claims of a chemical, therapeutic or bacteriologic nature in the sale of this tooth paste.

Manufactured by the Carel Laboratories, Redondo, Calif. No U. S. patent or trademark.

COLGATE'S RIBBON DENTAL CREAM.—Composition: Each 100 gm. contains glycerine, 28.0 gm., soap (vegetable), 5.0 gm., calcium carbonate, 35.7 gm., precipitated chalk, 7.6 gm., sodium benzoate, 2.1 gm., aromatics, 0.9 gm., corn starch, 6.5 gm., water, 14.2 gm.

Claims: No claims, except that it is an effective cleansing agent, are made.

Manufactured by the Colgate-Palmolive-Peet Co., Chicago, Ill.

DENTOSAL DENTAL CREAM.—Composition: Each 100 gm. contains sodium carbonate (Na_2CO_3), 3.7 gm.; sodium bicarbonate ($NaHCO_3$), 45.8 gm.; glycerine, 32.1 gm.; soap, 4.3 gm.; water, 12.7 gm.; flavoring, 1.4 gm.

Claims: The manufacturer has agreed to make no claims except that it is a soluble cleansing agent. No chemical, therapeutic or bacteriologic claims are made.

Manufactured by Aktiebolaget Dentosal, Stockholm, Sweden. General agent for U. S. A., Tage Samsioe, 255-B Shawmut Avenue, Boston. Mass. U. S. Patent 1460039 (June 26, 1923). U. S. trademark 187986.

DETROIT DENTAL AID COMMISSION TOOTH POWDER.—The product is stated to be made up as follows: calcium carbonate, precipitated, 60 gm.; magnesium oxide, 2 gm.; magnesium carbonate, 1 gm.; sodium bicarbonate, 30 gm.; powdered Castile soap, 6 gm.; sodium chloride (finely milled), 5 gm.; saccharine, 0.2 gm.; oil of gaultheria synthetic, 72 minims; oil of peppermint, 8 minims.

Claims: The Commission states that no claims will be made for this preparation other than of cleansing the teeth when used with the toothbrush.

Distributed by the Detroit Dental Aid Commission of the Detroit District Dental Society, Detroit, Mich. No U. S. patents or trademarks.

EPHRAIM DENTAL CREAM.—Composition: Each 100 gm. contains precipitated chalk, 42 gm.; milk of magnesia, 23 gm.; Castile soap, U.S.P., 1.0 gm.; glycerine, U.S.P., 21.0 gm.; gum tragacanth, U.S.P., 0.5 gm.; water, 12 gm.

Claims: No claims except that it is an effective cleansing agent for the teeth are made.

Distributed by Jerome W. Ephraim, Inc., 91 Warren Street, New York City. No U. S. patents or trademarks.

HENNEN'S TOOTH POWDER.—Composition: According to the manufacturer, each 100 gm. contains (approximately) Castile soap, 7 gm.; calcium carbonate, precipitated, 87 gm.; glycerine, 2 gm.; sodium chloride, 2 gm.; oil of peppermint, 1 gm.; methyl salicylate, 0.5 gm.; tincture of orris root, 0.1 gm.; saccharine, U.S.P., 0.13 gm.

Claims: The manufacturer agrees to make no claims except that this powder acts as a cleansing agent when used in conjunction with a toothbrush.

Manufactured by Hennen Products, Wheeling, W. Va. No U. S. patents or trademark.

IODENT TOOTH PASTE No. 1.—Composition: Precipitated calcium carbonate, 55 gm.; soap, 6 gm.; glycerine, 34 gm.; petrolatum, 1.25 gm.; saccharine, 0.25 gm.; oil of peppermint, 1.0 gm.; water, 2.26 gm.; and iodides (as potassium and calcium), 0.24 gm.

IODENT TOOTH PASTE No. 2.—Composition: Precipitated calcium carbonate, 30.14 gm.; prepared calcium carbonate, 30.14 gm.; soap, 7.23 gm.; glycerine, 28.9 gm.; petrolatum, 1.51 gm.; saccharine, 0.30 gm.; oil of peppermint, 1.20 gm.; water, 0.30 gm.; and iodids (as potassium and calcium iodids), 0.24 gm.

Claims: The manufacturer has agreed to limit the claims to the cleansing properties. In reference to the claims based on an iodide content, the Iodent Chemical Company has advised the Council.

"That we, the Iodent Company, will maintain the position of making no therapeutic claims until such a time as we shall have procured further credible data by experienced investigators, of sufficient technical ability and critical sense, whose observations may be described in sufficient detail to permit verification, together with clinical evidence and objective data, with such citation of sources as will enable the Council to confirm the facts and establish the scientific value of the conclusions drawn; and in such event, we herewith further state that we will not alter our position; until the Council shall have the opportunity to examine all such material and data, upon our request for examination thereof, with opportunity of the Council to satisfy itself as to the justification of any and all therapeutic claims for Iodent Tooth Paste that might be warranted thereby."

Manufactured by The Iodent Chemical Company, Detroit, Mich. No U. S. Patent. Trade Mark No. 127,621.

LACTONA DENTIFRICE.—Composition: Each 100 grams contains glycerine, 24.5 gm.; dicalcium phosphate, Victor (less than 400 mesh) 54.0 gm.; galactonic acid lactone, 3.0 gm.; water, 10.0 gm.; ethyl alcohol, 4.0 gm.; petrolatum, 1.0 gm.; gum tragacanth, gum karaya, each 0.75 gm.; malic acid, 0.25 gm.; sodium chloride, 0.6 gm.; saccharine, 0.07 gm.; menthol, oil of peppermint, etc. (flavoring), 0.8 gm.

Claims: The manufacturers agree to limit the claims for the product as an aid in cleaning the teeth.

Preliminary evidence submitted by the firm indicates that galactonic acid lactone in solution or in a tooth paste aids in removal of a smear of gastric mucin from a glass slide. This property is shared by lime water, sodium chloride solution, citrus fruit juices, tartaric and citric acids. (Hatton, E. H.; Nichols, Anna C., and Doherty, J. A.: Study of the Behavior of Mucin Smears, Treated by Acids, Alkalis, Soaps and Substances Containing Vitamin C, *J.A.D.A.*, 20:707 [April] 1933.)

As far as an analogy between the gastric mucin smears and the covering of mucin on the

teeth holds, the removal of salivary mucin from the teeth can be considered only temporary. In all probability, the teeth from which salivary mucin is removed would again become coated with mucin in a very short time.

The U. S. Patent Office has issued the following patents for a tooth-cleaning preparation containing galactonic acid lactone and other sugar acid lactones: 1,445,352, Feb. 13, 1923; 1,516,206, Nov. 18, 1924; Re. 15,691, Sept. 25, 1923; original 1,445,351, Feb. 13, 1923.

A member of the Council has studied the foregoing patents. In his opinion, the Council could not acquiesce in the validity of the claims allowed in those patents, as they pertain to the product described above as Lactona Dentifrice, because of the inclusiveness of the claims in the patents to cover other lactone and galactonic acid lactone products; because no evidence is available to support the tartar removing claims made in the patents, and because the composition of Lactona Dentifrice as given above, made acceptable to the Council, was not included in any of the patents submitted and, further, because acquiescence in the patent claims on the part of the Council, acting for the American Dental Association, might act to inhibit the prescribing of acid lactones of this type by the individual dentist when, in his judgment, such products might be useful for conditions under his care, as such a patent grants a virtual and unfair monopoly for the use of a substance which is amply described in the chemical literature.

It is pertinent to point out in this connection that the issuance of patents for dentifrices by the Patent Office needs more serious consideration than has been apparent from a study of many patents issued for dentifrice mixtures in the past. An investigation of a number of patents issued by the Patent Office for dentifrices indicates that they have been granted without complete and thorough investigation of the claims advanced therein. Such a state of affairs is not in the public interest. The Council urges, as a means of improving conditions, that the U. S. Public Health Service, the Food and Drug Administration of the Department of Agriculture and other scientific departments of the U. S. Government conversant with medicine and related subjects, be consulted before the issuance of patents for therapeutic or oral hygiene preparations relating to dentistry.

Manufactured by the Pfanstiehl Chemical Company, Waukegan, Ill. Distributors, Lactona, Incorporated, St. Paul, Minn. Trademark No. 248,109.

NABOC TOOTH POWDER.—Composition: Each 100 gm. contains soap (vegetable), 12 gm.; precipitated chalk, 82.6 gm.; sodium perborate, 3.0 gm.; aromatics, 0.9, and saccharine, 1.5 gm.

Claims: The manufacturer does not make any claims of a chemical, bacteriologic or therapeutic nature. Naboc is offered for whatever ability it may have to clean the surfaces of the teeth when used in conjunction with the toothbrush.

Manufactured by the Naboc Company, New York City. No U. S. Patent. Trade Mark No. 267.222.

PARKE-DAVIS DENTAL CREAM.—Composition: Each hundred grams is stated to contain magnesium hydroxide, not less than 3.7 gm.; glycerine, 31.3 gm.; corn starch, 4.7 gm.; saccharine, soluble, 0.015 gm.; calcium carbonate, precipitated, 46.9 gm.; soap, 2.3 gm.; flavoring, 0.70 gm. (oil of peppermint, oil of spearmint, oil of anise, menthol); water, 10.44 gm.

Claims: No claims, except that it is an agent to be used for cleaning the teeth when used in conjunction with the toothbrush, are made.

Manufactured and distributed by Parke, Davis & Company, Detroit, Mich. No U. S. Patent or trademark.

PLOUGH'S TOOTH PASTE.—Composition: Each 100 gm. contains calcium carbonate, precipitated, 32 gm.; magnesium carbonate, 3.5 gm.; soap, 5.6 gm.; glycerine, 30 gm.; water, 26.6 gm.; saccharine, 0.06 gm.; flavoring, 1.8 gm.; Indian gum and Irish moss, each, 0.3 gm., and coloring.

Claims: The manufacturer has agreed to make no claims except that it is an effective cleansing agent.

Manufactured by Plough, Inc., Memphis, Tenn.

PYCOPÉ TOOTH POWDER.—Composition: Each 100 gm. contains sodium chloride, 59.5 gm.; sodium bicarbonate, 19.8 gm.; magnesium carbonate, 4.9 gm.; sodium perborate, 14.9 gm.; oil of cloves, 0.3 gm.; methyl salicylate, 0.6 gm.

Claims: Pycopé is offered for whatever ability it may have to clean the surfaces of the teeth when used in conjunction with a toothbrush.

Manufactured by the Pycopé, Inc., Joplin, Mo. No U. S. Patent. U. S. trademark 203,276.

ARM AND HAMMER BRAND OF SODIUM BICARBONATE.—This product has been admitted to A.D.R. as complying with the provisions and specifications of the Council for dentifrices.

The manufacturers have agreed not to use in future advertising any claim that sodium bicarbonate corrects acid mouth; or any claim which cannot be substantiated by adequate scientific evidence.

(See U. S. Pharmacopeia X for descriptions, tests of identity and purity. Arm and Hammer and Cow brands of sodium bicarbonate meet the requirements of the U. S. P. X.)

Manufactured by the Church and Dwight Co., Inc., New York City. Copyrights 259, 620, July 9, 1929.

WARD'S TOOTH PASTE.—Composition: Each 100 grams is stated to contain, approximately: glycerine, 25.5 gm.; calcium carbonate, 30.1 gm.; powdered neutral soap, 1.2 gm.; magnesium hydroxide, 4.9 gm. (equivalent to approximately 75 per cent milk of magnesia, U.S.P.); powdered gum tragacanth, 0.9 gm.; saccharine, essential oils for flavoring, color and water to make 100 gm.

Claims: No claims, except that it is an agent to be used for cleaning the teeth when used with a toothbrush, are made.

Manufacturer and distributor: Montgomery Ward & Company, Chicago, Ill. No U. S. patents or trademarks.

ZANOL TOOTH PASTE.—Composition: Each 100 gm. contains glycerine, U.S.P., 39 gm.; soap, U.S.P., 4 gm.; precipitated chalk, U.S.P., 53 gm.; petrolatum, U.S.P., 1 gm.; flavoring (peppermint, cinnamon, wintergreen, saccharine, tragacanth), 3 gm.

Claims: The firm has agreed to make no claims except "for cleaning, polishing and beautifying the teeth."

Manufactured by the American Products Company, Cincinnati, Ohio. No U. S. patent. Trademark No. 81,313, March 21, 1911.

Dyes

Dyestuffs from natural sources have been known from time immemorable, but the exact knowledge of them has come about with the advent of modern organic chemistry. Their number is great. The use of a few of them in medicine has been extensively developed since the World War.

Much remains to be done to determine their exact usefulness in dentistry. In the treatment of ulcers of the buccal mucosa such as may be associated with bacterial action, various dyes have been applied, with allegedly beneficial results.

Chemically, the dyes of therapeutic or diagnostic interest may be divided into five groups: (1) the azo dyes, of which scarlet red medicinal, scarlet red sulphonate and dimazon are described in this book, and have been used in medicine for a considerable time; (2) the acridine dyes, such as acriflavine hydrochloride (introduced as "acriflavine"), acriflavine base (introduced as "neutral acriflavine") and proflavine; (3) the fluorescein dyes (mercurochrome is a mercury product in this group); (4) the phenolphthalein dyes, which are used as laxatives and for roentographic examination of the gallbladder and tests of kidney and hepatic functions; (5) the triphenylmethane or rosaniline dyes, comprising a large list of substances used in the industries, in the laboratory and, more recently, in medicine, and which include gentian violet, crystal violet, methyl violet, fuchsin and brilliant green; (6) dyes not in the foregoing categories, such as methylene blue, which is described in the U.S.P.

A physical classification is as interesting as, and in some respects more important biologically than, a chemical grouping, namely, a grouping as (1) crystalloids and (2) colloids. In the crystalloid group belong methylene blue, gentian violet and the phenolphthaleins. In the colloid group belong acriflavine, mercurochrome, trypan red, trypan blue, congo red and many others. The colloid group, as exemplified by congo red, are especially known for their protective actions on serum-precipitation and poisoning from drugs and bacterial toxins in animals regardless of their chemical composition (Hanzlik, P. J.: *Proc. Soc. Exper. Biol. Med.*, 29:369; 728, 1932.)

The fluorescein dyes, as well as their mercury derivatives, such as mercurochrome and also phenolphthalein dyes do not appear to be used to any extent in dentistry.

Much confusion has existed concerning the composition, nature and physical state of dyes. Various manufacturers of commercial dyestuffs make dyes with similar names but of vary-

ing composition, both qualitatively and quantitatively. Usually, the commercial dyes contain a diluent such as dextrin or salts. Hence, in order to obtain comparable results when used clinically, dyes of constant composition, preferably without diluent, should be used. Colloid dyes tend to precipitate in solutions containing electrolytes (salt solutions), but not in solutions of nonelectrolytes, such as dextrose. Crystalloid dyes tend to precipitate in solutions containing a common ion such as methylthionine hydrochloride (methylene blue) in physiologic sodium chloride solution. Such changes in state probably affect the action of the dyes. Hence, the proper choice of solvent or vehicle is essential. Much remains to be learned concerning the actions and uses of dyestuffs as dental medicinal agents. Conclusions concerning their therapeutic usefulness should be accepted with reserve, until such conclusions have been confirmed by independent workers.

THE AZO DYES

The azo dyes have been used in medicine for many years under the name "scarlet R." Chemically, they contain the grouping—N:N—combined with betanaphthol. This book follows "New and Nonofficial Remedies" in distinguishing between two scarlet R compounds: Scarlet R medicinal Biebrich is described as toluylazototuylazobetanaphthol, and scarlet red sulphonate, which is the sodium salt of azobenzenedisulphonic acid azobetanaphthol. It differs from the former in that the methyl group (CH_3—) of the toluyl radical have been replaced by the sodium sulphonate groups (—SO_3Na).

Opinions are divided concerning their clinical value in general surgery, but the dyes are assumed to promote the growth of epithelium in the treatment of burns, wounds, chronic ulcers, etc. The exact field of usefulness in dental practice does not appear to have been determined.

Dosage: The scarlet R preparations are generally used in the form of an ointment containing from 4 to 8 per cent of the substance. The 8 per cent ointment is stated to be somewhat irritating and should be alternated with a soothing ointment. Dimazon is generally used in the form of a 2 per cent ointment; it is also employed as a dusting powder (mixed with talcum) or as a solution in oil.

PYRIDIUM.—Phenylazo-2-6-diamino-pyridine monohydrochloride.—Phenylazo-α-α-diamino-pyridine monohydrochloride. $C_6H_5N:N\ C_5H_2N\ (NH_2)_2(2)\ (6)\ HCl$. The monohydrochloride of an azo dye of the pyridine series, phenylazo-α-α-diaminopyridine. Pyridium contains 28 per cent of nitrogen.

Action and Uses: Pyridium is said to be bactericidal in aqueous solution against staphylococci, streptococci, gonococci, *B coli, B. diptheriae* and the spirochete and fusiform bacillus of Vincent's infection. Reports by a number of observers have indicated its usefulness in the treatment of infections due to the above-named organisms. This dyestuff imparts an intense redness to tissues and dressings and when absorbed in sufficient quantities even from the oral mucosa will tinge the urine. Although the clinical evidence for its use in dentistry is fragmentary, it is maintained that the local application is beneficial in the treatment of postoperative and traumatic lesions, and for use in sockets after extractions and in ulcerative processes.

Pyridium has some penetrating power and is nontoxic and nonirritating in therapeutic dosage when taken internally.

Dosage: For local application, pyridium may be applied in an aqueous solution of 0.5 to 1 per cent, or pyridium ointment up to 10 per cent may be used. It is suggested that it may be applied as a paste consisting of a mixture of pyridium powder and pyridium solution in the desired consistency. For application directly to fistulas, a 0.5 per cent solution may be used.

Pyridium should not be used in connection with compounds containing mercury as it releases the mercury from such compounds. Its use is contraindicated when uremia and severe disorders of the kidneys of a noninfectious type are present.

Pyridium is only slightly soluble in cold water, about 1 part in 300. It will form supersaturated solutions relatively easily. Pyridium will precipitate out of a 2 per cent (supersaturated) solution after approximately two days; it will precipitate out of a 1 per cent solution only after months. A 1 per cent solution may be stabilized for months by the addition of 10 per cent dextrose, U. S. P. X. Aqueous solutions should be prepared with

distilled water, as the salts present in the tap water of many localities are liable to precipitate the free base phenylazo-α-α-diaminopyridin.

Manufactured by the Pyridium Corporation of New York (Merck & Co., Inc., distributor). U. S. patents Re. 17,281 (April 23, 1929; expires 1946), 1,680,109 (Aug. 7, 1928; expires 1945). U. S. trademark 251,253.

Aqueous Solution of Pyridium, 1 per cent: Pyridium, 1 gm.; anhydrous dextrose, 10 gm.; distilled water to make 100 c.c. This is a supersaturated solution. Any deposit appearing may be redissolved by warming.

Pyridium Ointment, 10 per cent: Pyridium, 10 per cent; wool fat, 77.5 per cent; expressed oil of almond, 12.5 per cent.

Pyridium Tablets, 0.1 gm.

Pyridium occurs as a red, odorless, microcrystalline powder, possessing a slightly bitter taste; slightly soluble in cold water, about 0.3 part in 100 parts; soluble in boiling water, about 5 parts in 100 parts, slightly soluble in alcohol, soluble in glacial acetic acid and glycerin; insoluble in acetone, benzene, chloroform, ether and toluene. These solvents, if not entirely free from water, may become yellow on the addition of pyridium. The aqueous solution (1 in 500) is red and is distinctly acid in reaction when measured by means of the hydrogen electrode. On addition of diluted sulphuric acid or a dilute solution of sulphates to an aqueous solution of pyridium a precipitate forms.

Methods of assay and tests of identity may be found in "New and Nonofficial Remedies," 1931, page 152.

SCARLET R MEDICINAL BIEBRICH.—Rubrum Scarlatinum.—Toluylazotoluylazo-β-naphthol.—$CH_3C_6H_4N:NC_6H_3.CH_3N:N.C_{10}H_5.OH$.—A compound of betanaphthol and diazotized amidoazo-o-toluol.

Actions, Uses and Dosage: (See preceding paragraph, "Azo Dyes.")

Biebrich scarlet R medicinal is a dark brownish red powder, nearly insoluble in water, slightly soluble in benzene and acetone and easily soluble in chloroform, oils, fats and phenols. It is slightly soluble in cold alcohol, and somewhat more soluble in hot alcohol, while warm petrolatum and paraffin dissolve rather large quantities.

Scarlet R Medicinal Kalle: A brand of scarlet R medicinal Biebrich.

Manufactured by Kalle & Co. Aktiengesellschaft, Biebrich a/Rh., Germany (Heilkraft Medical Company, Boston, distributor). No U. S. patent or trademark. Sold in the form of ointment only.

Scarlet R Salve: Biebrich scarlet R medicinal-Kalle & Co.—8 parts, eucalyptol—2 parts, and petrolatum—90 parts.

Prepared by the Heilkraft Medical Company, Boston.

Scarlet R Medicinal Biebrich-Merck: A brand of scarlet R medicinal Biebrich.

Merck & Co., Inc., Rahway, N. J., distributor.

Scarlet R Medicinal—"National": A brand of scarlet R medicinal Biebrich.

Manufactured by the National Aniline and Chemical Co., New York. No U. S. patent or trademark.

SCARLET RED SULPHONATE.—The sodium salt of azobenzene-disulphonic acid azo-betanaphthol.—$C_6H_4(SO_3Na)N:N.C_6H_3(SO_3Na)N:N.C_{10}H_6OH$.

Actions, Uses and Dosage: (See preceding article, "Azo Dyes.") Scarlet red sulphonate is marketed only in the form of ointment and emulsion.

Manufactured by Badische Anilin und Sodafabrik, Ludwigshafen, Germany. Parke, Davis & Co., Detroit, Mich., distributor.) No U. S. patent or trademark.

Scarlet Red Ointment, 5 per cent-P.D. & Co: Scarlet red sulphonate, 5 parts; petrolatum containing a small amount of wax, 95 parts.

Scarlet Red Ointment, 10 per cent-P.D. & Co.: Scarlet red sulphonate, 10 parts; petrolatum containing a small amount of wax, 90 parts.

Scarlet red sulphonate is a dark, brownish red powder; odorless. It is soluble in water; slightly soluble in ether, alcohol and acetone; almost insoluble in chloroform, benzene, fixed oils, fats and petrolatum.

DIMAZON.—Diacetylaminoazotoluene.—$CH_3C_6H_4.N:HC_6H_3(CH_3)N(CH_3CO)_2$.

Actions, Uses and Dosage: (See preceding article, "Azo Dyes.")

Manufactured by Kalle & Co., Aktiengesellshaft, Biebrich, a/Rh., Germany (Heilkraft Medical Company, Boston, Mass.). U. S. patent expired. U. S. trademark 89,119.

Dimazon Ointment: Dimazon 2 parts and petrolatum 98 parts.

Prepared by Heilkraft Medical Company, Boston, Mass.

Dimazon Oil: Dimazon 2 parts and mineral oil 98 parts.

Prepared by Heilkraft Medical Company, Boston, Mass.

Dimazon is prepared by the acetylization of amidoazotoluene. It is an orange colored crystalline powder, insoluble in water but readily soluble in alcohol, ether, chloroform.

acetone and benzene, oils, fats and petrolatum. It can be removed from cloth by washing with soap and water. It melts at 75 C.

The Acridine Dyes

The acridine derivatives are mostly yellow dyes—acridine dyes obtained from coal tar—to which the term "flavine" has been applied ("flavine" should more correctly be applied to a vegetable coloring matter). The representative acridine dyes used in medicine are acriflavine hydrochloride (introduced as "trypaflavine" and "acriflavine"), acriflavine base (introduced as "neutral trypaflavine" and "neutral acriflavine") and proflavine. In 1912, Ehrlich found that acridine dye diaminomethylacridinium chloride hydrochloride possessed therapeutic properties when used in trypanosome infections and hence he termed it "trypaflavine." Later, this substance was investigated in England, particularly in regard to its effects as a wound antiseptic, and the name "acriflavine" was applied to it. In a generic sense, the terms "trypaflavine" and "acriflavine" have been applied both to acriflavine base and acriflavine hydrochloride. Another closely related substance, diaminoacridine monohydrogen sulphate, to which was given the name "proflavine," was studied also. A considerable number of bacteriologic experimental and clinical reports in the medical field on these substances have been published. While these dyes appear to possess antiseptic and germicidal actions on bacterial cultures *in vitro,* they have been found ineffective in experimental infections under controlled conditions. (Meleney and Zan: *J.A.M.A.,* 84:337, 1925. Walker and Sweeney: *J. Pharm. & Exper. Therap.,* 26:461, 1926.) They have been tried in a number of clinical conditions with varying success.

The colloidal properties of acriflavine have been demonstrated by Hirschfelder and Wright (*J. Pharm. & Exper. Therap.,* 38:411; 39:13, 1930.) The systemic and local actions may be nonspecific as for other colloidal agents.

Actions and Uses: The antiseptic or bacteriostatic action of acriflavine hydrochloride and proflavine appears to be weakened in the presence of serum. In the treatment of wounds, it is claimed that these drugs are comparatively free from toxic or irritant action on living tissues and that they do not inhibit appreciably the phagocytic action of the leukocytes on the healing process. Applications of acriflavine hydrochloride, acriflavine base and proflavine have been employed in the treatment of wounds, urethritis, gingivitis, gonorrheal conjunctivitis, blennorrhea, eczema, furunculosis, otitis media and other conditions requiring the use of an antiseptic.

The foregoing uses are listed as a suggestion for their use in dental practice.

When taken by mouth, the dyes tend to render the urine antiseptic provided the reaction of the secretion is alkaline. The use of acriflavine base rather than acriflavine has been suggested in areas where freedom from irritation (due to the acid reaction of acriflavine hydrochloride and proflavine) is desirable.

It is stated that caution should be exercised in its use in the treatment of root canals, tooth cavities, gum tissue, etc., as it produces a powerful yellow stain on dentin. In the treatment of ulcers of the buccal mucosa such as may be associated with Vincent's infection, the various dyes have been applied with allegedly favorable results, but confirmation of these reports in a large number of controlled cases is necessary.

Dosage: In the treatment of wounds, the solution generally employed is 1:1,000 in physiologic solution of sodium chloride, although weaker solutions may be used. In suppurating wounds, this solution is used for syringing and swabbing the wound after free incision, for irrigation after providing adequate drainage and for saturating the gauze with which the wound is finally covered. Evaporation should be prevented by protective dressing, In cavities, gauze saturated with the solution may be applied as a light packing. Fresh wounds are cleansed thoroughly with the solution, and as much of the solution as possible is left in contact with the injured surfaces. Such wounds may be closed by suture, and may be expected to heal by first intention.

In gingivitis, the mouth may be irrigated with a 1:1,000 solution.

Solutions of acriflavine hydrochloride, acriflavine base and proflavine may be boiled, or heated in an autoclave to 130 C., without decomposition, but they are sensitive to light and should be stored in amber bottles. (Many of the drugs used in dental practice are sensitive to light and the influence of the air. They are best kept in amber colored bottles

and protected by a double-stoppered arrangement similar to that found in the so-called "ether bottle." The amber bottle should be fitted on the inner surface of the neck with a ground glass stopper and the outside of the bottle neck should be fitted with a ground glass cap.)

ACRIFLAVINE HYDROCHLORIDE. — Acriflavinae Hydrochloridum-Acriflavine.—3:6 diamino-10-methylacridinium chloride monohydrochloride.—2.8 diamino-N-methylacridinium chloride hydrochloride.

Actions, Uses and Dosage: (See preceding article, "Acridine Dyes.")

Acriflavine hydrochloride is a brownish red, odorless crystalline powder. It is soluble in about 3 parts of water and in alcohol and nearly insoluble in ether, chloroform, liquid petrolatum and fixed and volatile oils. The solutions are dark red and fluoresce on dilution. "New and Nonofficial Remedies," 1931, contains standards of identity and purity.

Acriflavine Hydrochloride-Abbott: A brand of acroflavine hydrochloride.

Manufactured by The Abbott Laboratories, North Chicago.

Tablets Acriflavine Hydrochloride-Abbott, 0.03 Gm.: Each tablet contains acriflavine hydrochloride-Abbott, 0.03 gm. (0.46 grain).

Acriflavine "National": A brand of acriflavine hydrochloride.

Manufactured by the National Aniline and Chemical Co., New York City.

ACRIFLAVINE BASE.—Neutral acriflavine.—The base 3.6-diamino-10-methylacridinium chloride.—*2*:8 diamino-N-methylacridinium chloride.

Actions, Uses and Dosage: (See preceding article, "Acridine Dyes.")

Acriflavine Base is a brownish red, odorless. granular powder. It is soluble in about 3 parts of water; incompletely soluble in alcohol and nearly insoluble in ether, chloroform and the fixed oils. The aqueous solution is brownish red, and fluoresces on dilution.

Neutral Acriflavine-Abbott: A brand of acriflavine base.

Manufactured by The Abbott Laboratories, North Chicago. No U. S. trademark.

Neutral Acriflavine Jelly 1:1,000-Abbott: Neutral acriflavine-Abbott, 0.1 part, dissolved in karaya gum jelly, containing sufficient sodium hydroxide so that the finished product has a p_H of about 8.5 to make 100 parts.

Tablets Neutral Acriflavine-Abbott, 0.03 Gm. (half grain).

Neutral Acriflavine "National": A brand of acriflavine base.

Manufactured by The National Anailine and Chemical Co., New York City. **No. U. S. trademark.**

Neutral Acriflavine "National" Troches: Each contains neutral acriflavine "National" 0.006 Gm., menthol 0.0006 Gm. and sodium chloride 0.0006 Gm.

PROFLAVINE.—Proflavina.—3:6-diaminoacridinium monohydrogen sulphate.—2:8-diaminoacridinium monohydrogen sulphate.

Actions, Uses and Dosage: (See preceding article, "Acridine Dyes.")

Proflavine is a reddish brown, odorless, crystalline powder. It is soluble in water and in alcohol, forming brownish solutions which fluoresce on dilution; it is nearly insoluble in ether, chloroform, liquid petrolatum, fixed oils and volatile oils. An aqueous solution of proflavine is neutral to litmus.

Proflavine-Abbott: A brand of proflavine.

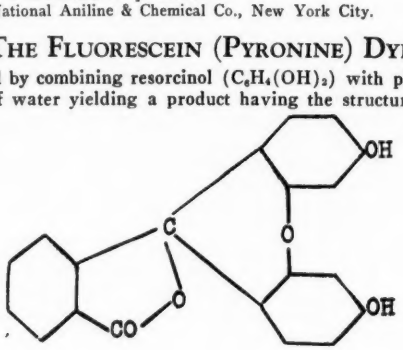
Manufactured by The Abbott Laboratories, North Chicago, Ill.

Proflavine-"National": A brand of proflavine.

Manufactured by the National Aniline & Chemical Co., New York City.

The Fluorescein (Pyronine) Dyes

Fluorescein is formed by combining resorcinol ($C_6H_4(OH)_2$) with phthalic anhydride with the elimination of water yielding a product having the structural formula:

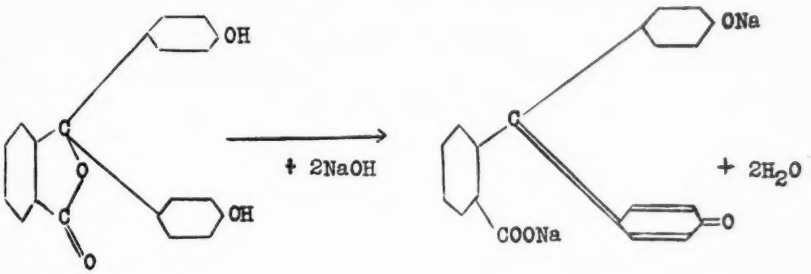


The product is closely related to phenolphthalein and its derivatives (which are described in the next section), differing chiefly in the presence of the oxygen molecule between the two ortho positions of the resorcinol nuclei.

Actions and Uses: Fluorescein has been employed mainly as a diagnostic agent in ophthalmologic work. Flumerin and mercurochrome-220 soluble are used as antiseptics, but are of questionable value. Flumerin has also been employed in the treatment of syphilis. None of the fluorescein drugs are described in "Accepted Dental Remedies," as there appears no critical evidence to warrant their use in dental practice. They are mentioned only for purposes of general information. Mercurochrome is extensively exploited to the laity as a household antiseptic and is met with in dental conditions as the result of popular usage.

The Phenolphthalein Dyes

Phenolphthalein, long used by chemists as an indicator before its therapeutic properties were discovered, is a condensation product of phthalic anhydride and phenol. In neutral and acid mediums, it exists in the form in which there is no quinoid group, but the presence of alkali ($p_H = 8$ to 10) causes the characteristic rearrangement with typical salt formation and the presence of a quinoid group whereby the beautiful red color is formed:



Colorless form Quinoid form (colored)

This reaction is also characteristic of other members of the series. Phenolsuphonphthalein, which chemists also use as an indicator, contains an SO_2 group in place of the CO group in the phthalic anhydride nucleus. In phenoltetrachlorphthalein, the four hydrogen atoms in the benzene ring belonging to the phthalic acid nucleus have been replaced, by chlorine; in tetrabromophenolphthalein, the four bromine atoms are in the phenol groups, two in each; this, it will be noted, is a different substitution from that in the case of phenoltetrachlorphthalein.

Actions and Uses: All of the compounds of the phenolphthalein type are used in medicine as diagnostic agents except phenolphthalein itself, which is used not because of its property of color formation but because of its action on the intestine. Phenolphthalein is a laxative and is an ingredient of many nostrums sold to the laity, and from such usage disturbing side actions and poisoning have followed. It is official in the U.S.P.X. Phenolsulphonphthalein and phenoltetrachlorphthalein are used because they pass unchanged through the body and at the same time have the property of intense color formation when the excretions are collected and alkalinized. Dyes of this group are used in tests of liver function, and of kidney function and for visualization of the gallbladder. No critical evidence relating to the use of this group of dyes in dental practice has appeared. They are mentioned for purposes of information.

The Triphenylmethane (Rosaniline) Dyes

The triphenylmethane dyes are compounds of the underlying hydrocarbon, triphenylmethane [$(C_6H_5)_3CH$] and its homologue, tolyldiphenylemethane. Medicinally, those of greatest

interest result from the introduction of amino groups forming pararosaniline (triaminotriphenylcarbinol ($NH_2C_6H_4)_3COH$) and rosaniline (triaminodiphenyltolylcarbinol ($NH_2C_6H_4)_2(CH_3NH_2C_6H_2)COH$). When rosaniline is treated with hydrochloric acid, a typical red dye known as fuchsin, $NH_2C_6H_4.CH_3.NH_2C_6H_2C:C_6H_4:NH_2Cl$, is obtained. The red is changed to violet by replacing hydrogen of the amino ($-NH_2$) group by methyl groups; the intensity of violet increasing with the number of methyl groups. Thus, there is the closely related methyl violet, gentian violet and crystal violet. There appears to be little difference therapeutically between the tetra, penta and hexa methyl derivatives; although the dyes on the market may be a mixture of these. The compounds which have been used by dentists so far have been those passing under the names crystal violet, gentian violet and brilliant green. As the therapeutic effect of the tetra, penta and hexa-methylpararosanilines appear to be therapeutically equal, preference should be had for the hexa methyl compound, because its identity and purity is more liable to chemical control.

An investigation of several marketed brands of gentian violet, crystal violet and brilliant green in the A.D.A. Bureau of Chemistry showed wide variations in the purity, amount of undesirable foreign substances (inorganic salts, tars, etc.).

Brilliant green, also known as malachite green-G (tetraethyldiparaminotriphenyl carbinol anhydride sulphate has been used in dental practice alone or in combination with crystal

$$\left[C_6H_5C \begin{matrix} -C_6H_4N(C_2H_5)_2 \\ -C_6H_4N(C_2H_5)_2 \end{matrix} \right\rangle H_2SO_4 \Bigg]$$

violet (1 per cent of each) in 50 per cent alcohol solution. This mixture has been suggested in the treatment of discharging fistula, chronic gingivitis, Vincent's infection or "trench mouth" and suppurative conditions from fracture, extraction or pyorrhea. (*J. Dent. Res.*, 2:21, 1920.)

The introduction of this dyestuff as well as crystal violet (hexamethylpararosaniline) into dentistry was stimulated in large part by the investigations of Browning and others in the treatment of war wounds. Crystal violet is sometimes given the misnomer gentian violet. Gentian violet is a poorly defined name as it may be a mixture of dextrin and of dyestuff; tetra, penta and hexa methylpararosaniline. As crystal violet represents the completely methylated pararosaniline, dentists should determine this at the time of preparing a solution for office use. The investigations of Browning, Berwick and others indicate the mixture to be more efficacious than either brilliant green or crystal violet alone although this view is not generally shared. This mixture has been given the nonproprietary designation "viogen" in the clinic of the University of California Dental School. They may be employed in a concentration of 1:100. The dyes give rise to stains which may be removed by the application of sodium hypochlorite solution.

Actions and Uses: Churchman, of Cornell University Medical School, found that solutions of gentian violet possessed a selective action on certain bacteria and that the majority of gram-negative organisms survived exposure to gentian violet solutions in strengths far in excess of that required to kill gram-positive organisms.

The action of a dye is sufficiently selective that often a "strain within a species" is not affected. Gentian violet is stated to posses properties of great penetration; and to be bactericidal, also bacteriostatic *in vivo,* toward the selective organism.

Its chief application has been in the treatment of affections in which staphylococci, streptococci, *B. pyocyaneus* and *B. diphtheriae* are the causative agents.

Churchman also has found that acid fuschsin (the acid sodium salt of fuchsin disulphonic and trisulphonic acids) is, in some respects, the opposite of gentian violet in selective power, a strained culture of *B. prodigiosus* being killed by the acid fuchsin, while the gram-positive *B. anthracis* is unaffected.

Acid fuchsin is incompatible with gentian violet, and the compatibility of mixture of dyes should be determined before any combination is prepared.

GENTIAN VIOLET MEDICINAL.—A mixture of pentamethylpararosaniline chlorides.

Actions and Uses: (See preceding article, "Triphenylmethane [Rosaniline] Dyes.")

Dosage: (See preceding article, "Triphenylmethane [Rosaniline] Dyes.")

Gentian Violet Improved Medicinal: A brand of gentian violet medicinal.

Manufactured by The Coleman and Bell Company, Norwood, Ohio. No U. S. patent or trademark.

Gentian Violet Medicinal—"National": A brand of gentian violet medicinal.

Manufactured by the National Aniline and Chemical Company, New York City. No U. S. patent or trademark.

Tablets Gentian Violet Medicinal—"National," 0.0324 Gm. (½ grain).

CRYSTAL VIOLET.—Pararosaniline violet. The hydrochloride of the base hexamethylpararosaniline $(CH_3)_2N = C_6H_4 = C(C_6H_4)N(CH_3)_2$.

Actions and Uses: (See preceding article, "Triphenylmethane [Rosaniline] Dyes.")

Dosage: For direct application, 1:500 to 1:2000 solution may be employed. In dentistry, it is mainly employed as a 1 per cent solution with brilliant green in the same proportion in 50 per cent alcohol.

BRILLIANT GREEN.—Malachite green-G; ethyl green. The sulphate of the base tetra ethyl diamino triphenylmethane. $(C_2H_5)_2N=C_6H_4=C(C_6H_5)[C_6H_4N(C_2H_5)_2]$.

Actions and Uses: (See preceding article, "Triphenylmethane [Rosaniline] Dyes.")

Dosage: It is employed in 1 per cent solution in combination with crystal violet (which see) in 50 per cent alcohol.

Brilliant Green-Coleman and Bell: A brand of brilliant green.

Manufactured by The Coleman and Bell Company, Norwood, Ohio. No U. S. patent or trademark.

Brilliant Green-Gruebler: A brand of brilliant green.

Manufactured by G. Gruebler and Company. Akatos, Inc., New York City, American distributor. No. U. S. patent or trademark.

Brilliant Green—"National": A brand of brilliant green.

Manufactured by National Aniline and Chemical Company, Inc., New York City. No U. S. patent or trademark.

EMETINE HYDROCHLORIDE, U.S.P.—Emetinae Hydrochloridum (Emet. Hydrochl.). The hydrochloride of the alkaloid emetine obtained from ipecac, or prepared synthetically, with not more than 9 per cent of water.

Properties: Emetine hydrochloride occurs as white or very slightly yellowish crystalline powder. It is freely soluble in water or alcohol.

Actions and Uses: Emetine is one of the alkaloids of ipecac. Its pharmacologic actions are similar to those of the plant. Emetine produces local irritation and nausea and emesis, by central and local actions.

The supposed production of pyorrhea alveolaris by endamebae led to the use of ipecac and emetine locally and intravenously. The early favorable results were not later confirmed. Some clinicians still hold that application of emetine in 0.5 to 1 per cent solution should be a routine measure in treatment of pyorrhea. In view of the circumstance that pyorrhea alveolaris has not been shown to be specifically an ameba infection, this conclusion is incorrect. Although it is possible that a beneficial action may occur in some other way, its use in pyorrhea appears to be largely empiric.

Dosage: Applied topically.

Ampules of Emetine Hydrochloride, N. F. V.: A sterile solution of physiologic sodium chloride solution containing 0.03 gm. (one-half grain) of emetine hydrochloride in each cubic centimeter.

EPINEPHRINE, U.S.P.—Epinephrina (Epinephrine). (Adrenalin).—*laevo*-methylaminoethanolcatechol. $(C_9H_{13}O_3N.)$

Properties: Epinephrine is a white or light brownish, microcrystalline, odorless powder, gradually darkening on exposure to the air. It is very slightly soluble in water and in alcohol. It is insoluble in ether, chloroform and acetone, and in fixed or volatile oils.

Epinephrine, the active principle of the suprarenal gland, is extensively used in dental surgery and general surgery and to a less extent in medicine in the form of 1:1,000 solution of epinephrine hydrochloride. Both the substance and the solution (solution of epinephrine hydrochloride) are official in the U.S.P., which carries tests for identity and purity. The alkaloid, in addition to being obtained from the suprarenal gland, is also prepared synthetically, and such preparations, if they are levorotatory, are as active as the natural product. Synthetic epinephrines which are optically inactive have also been prepared. These are only

about half as active physiologically as natural epinephrine. Dextrorotatory epinephrine is still weaker, having about only one-twelfth to one-eighteenth the activity. A number of related compounds have been prepared, but up to the present time, only epinephrine has found extended usefulness in dentistry. (Reports of the Council: Epinephrin Substitutes and Reactions in Local Anesthesia, *J.A.D.A.*, December, 1930.)

Actions and Uses: Epinephrine has a variety of therapeutic uses. The characteristic effect may be observed on injection into a vein. It acts peripherally on a variety of structures by stimulating the myoneural junction of the sympathetic nerve endings. The extended use of epinephrine in dentistry is due to its local effects on the vessel by virtue of its vasoconstrictor properties. It induces complete contraction of the vessels in any part to which it is applied, and furthermore it has practically only local effects unless injected directly into the blood vessels. Almost complete bloodlessness of a part may be obtained by subcutaneous injection without significant alteration of the blood pressure and without irritation. This property has been responsible for the use in dental surgery of the drug, which is now widely used as a component of local anesthetic mixtures for dental operations. When so used, it not only insures a bloodless field for operation, but also limits the absorption of the anesthetic and prolongs its action. This action is not a true synergism, but rather delays diffusion and dilution of the anesthetic agent by too rapid absorption into the blood stream.

A solution of epinephrine has been useful in hemorrhage from the mouth and throat. Hanzlik (*J. Exper. Pharm. & Therap.*, 10:509; 12:71, 1918) has found epinephrine an efficient hemostatic agent. Liquor epinephrine hydrochloride is applied locally for this purpose. But here local considerations have a profound bearing on the control of hemorrhage.

Epinephrine is sometimes effective in anesthetic accidents and in shock of operation, but for this purpose, it must be injected intravenously, care being taken not to give an overdose. The considerable effects on blood pressure and the heart which may occur require special experience and watchfulness of the patient.

Dosage: For local anesthesia in dentistry, from 1 to 5 minims of 1:1,000 solution per cubic centimeter is used, or, in substance, 0.00002 to 0.00013 gm. (1/3,500 to 1/500 grain).

Solution of Epinephrine Hydrochloride U.S.P., Liquor Epinephrine Hydrochloride (Liq. Epineph. Hydrochlor.): A solution of epinephrine hydrochloride about 1 in 1,000. It should be stored in a brown bottle and in a dark place.

Actions and Uses: The same as for epinephrine.

Adrenalin: A brand of epinephrin U.S.P., made from the suprarenal gland.

Manufactured by Parke, Davis & Company, Detroit, Mich. U. S. patent 730,175, 730, 176, 730,196 730,197, 730,198 (June 2, 1903; expired); 753,177 (Feb. 23, 1904; expired). U. S. trademark 53,934.

Adrenalin Chloride Solution: A solution containing 1 part of adrenalin chloride in 1,000 parts of physiologic salt solution, preserved by the addition of 0.5 per cent of chloretone.

Adrenalin and Cocaine Tablets: Each hypodermic tablet contains cocaine hydrochloride 0.01 gm. (1/6 grain), and adrenalin 0.00005 gm. (1/1,300 grain).

Ampoules Adrenalin Chloride Solution 1:1,000, 1 c.c.: A solution of adrenalin chloride, 1 part, in physiologic solution of sodium chloride, 1,000 parts, with preservative.

Ampoules Adrenalin Chloride Solution ℞ 2, 1:2,600, 1 c.c.: A solution of adrenalin chloride, 1 part, in physiologic solution of sodium chloride, 2,600 parts, without preservative.

Ampoules Adrenalin Chloride Solution ℞ 1, 1:10,000, 1 c.c.: A solution of adrenalin chloride, 1 part, in physiologic solution of sodium chloride, 10,000 parts, without preservative.

Adrenalin Tablets: One thousandth gram (3/200 grain) adrenalin, as borate, yielding a 1 in 1,000 solution when dissolved in 15 minims (1 c.c.) of water.

Adrenalin Tablets No. 2: Each contains adrenalin 0.00033 gm. (1/200 grain) as borate, yielding a 1 in 1,000 solution when dissolved in 5 minims of water.

BUREAU OF PUBLIC RELATIONS

THE STATE DENTAL SOCIETY AS A PUBLIC HEALTH FACTOR

By J. A. SALZMANN,* D.D.S., New York City

WHEN asked by the president of the Pennsylvania State Dental Society to take charge of the publicity of the sixty-fifth annual meeting, I was reminded of the following criticism I had made in reviewing the sixty-second annual meeting of the society:

> Nowadays, we are greatly concerned with mouth hygiene, preventive dentistry, prophylactic odontotomy, oral hygiene, oral prophylaxis, etc., *ad infinitum;* and yet when we have the opportunity to impress those things on the public, we fail to do so. Furthermore, we actually place guards at all entrances to keep out all and sundry who might be venturesome enough to try to find out what dentistry has to offer to the public.[1]

It was with the desire to obviate such criticism that the task assigned was approached. Thanks to the far-sightedness of George A. Coleman, president of the Pennsylvania State Dental Society, who personally underwrote almost 50 per cent of the expense involved, public dental health was given a prominent place on the program of the annual meeting of the state dental society for the first time in the sixty-five years of its existence.

ORGANIZATION OF THE CAMPAIGN

With the approval of the committee in charge of the annual meeting to be held by the state dental society, the support of the local dental organizations was obtained to hold a "Dental Health Campaign and Exhibit" concurrently with the state meeting, on May 1-4, 1933. A committee of twenty-five men was appointed, affording equal representation to the various organizations under whose auspices the work was to be performed. L. Biddle Duffield, of Philadelphia, was appointed chairman and I, director of the campaign and exhibit. A treasurer and secretary were appointed and the following subcommittees selected: 1. Radio Program Committee. 2. School Contact Committee. 3. Exhibit Censorship Committee. 4. Finance Committee. 5. Publicity Committee. Meetings were held at frequent intervals where progress reports were made and discussed.

It was felt advisable to carry on the undertaking on a smaller scale if necessary rather than to solicit funds from commercial concerns. It was the intention to make the campaign and exhibit "the contribution of the dental profession to public health," on a highly scientific and professional plane, without having to consider the claims of commercial products as such. With the aid of contributions from the local dental organizations, the president of the state society and a few individuals, a little over $400 was raised. Printing, postage, carpenter work, shipping charges for exhibits and the customary incidentals made up the bulk of the expense. The exhibit room was furnished free by the hotel management, which also provided us

*Director, Philadelphia Dental Health Campaign and Exhibit, 1933.

1. D. Roster, May 24, 1930.

PENNSYLVANIA STATE DENTAL SOCIETY

DENTAL HEALTH CAMPAIGN AND EXHIBIT

PHILADELPHIA, MAY 1, 2, 3, 4, 1933

CARE OF THE MOUTH AND THE TEETH

There are three preventive measures which should be used in order to have a clean and healthy mouth. These preventive measures are (1) proper diet, (2) cleanliness, (3) regular dental attention.

PROPER DIET

The first preventive measure we will not discuss as you have probably received a copy of the diet sheet at this exhibit.

SUGGESTED METHOD OF BRUSHING

The teeth should be brushed at least twice a day—in the morning before breakfast and at night before retiring.

A small toothbrush is most desirable but it is better to have two toothbrushes which can be used alternately each day. Brush at least two minutes by the clock each time. Change the toothbrush when the bristles become soft.

In brushing the teeth the jaws should be held slightly apart so that the upper teeth do not meet the lower ones. The teeth of each jaw should be brushed separately; the upper teeth downward and the lower teeth upward.

UPPER TEETH

It is advisable to place the toothbrush well back into the side of the mouth as far as the last tooth between the cheek and the gums. The side of the bristles to rest against the gum with the bristles pointing upward. Partly close the mouth and with a rolling motion bring the bristles firmly over the gums and teeth toward the biting surfaces so that it is possible to feel the bristles slide between the teeth. Continue this motion and slowly work forward to the front teeth. Clean the inside surfaces of the upper teeth in the same manner.

LOWER TEETH

The lower teeth are brushed in the same manner except that it is necessary to turn the ends of the bristles downward before placing the brush in the mouth. Then with a rolling motion bring the bristles of the brush upward toward the biting surface. Clean the inside surface of the lower teeth in the same way.

GRINDING OR BITING SURFACES

The broad, uneven grinding surfaces of the teeth easily catch particles of food. This food should be removed to prevent decay. Place the brush firmly on the grinding surfaces of the teeth and with a backward and forward motion force the bristles well into the grooves of the teeth while brushing.

After brushing the teeth it is of great importance that the mouth be thoroughly rinsed with lukewarm water forced back and forth between the teeth several times.

CARE OF THE TOOTHBRUSH

Wash thoroughly with soap and warm water after using; hang up to dry in sunshine, if possible.

REGULAR DENTAL ATTENTION

Regular dental attention is also necessary to keep the teeth and gums in good condition; even though the right foods are eaten, and teeth kept clean, the teeth may decay. Having the teeth cleaned and a thorough examination by your dentist *at least* every six months will help to prevent serious trouble in the future.

Fig. 1.—Circular prepared by Pennsylvania Dental Hygienists Association and distributed to public.

PENNSYLVANIA STATE DENTAL SOCIETY

DENTAL HEALTH CAMPAIGN AND EXHIBIT

PHILADELPHIA, PA., MAY 1-2-3-4, 1933

Protect Teeth by Adequate Dental Care and Proper Food

Good nutrition and a well-balanced diet are fundamental for dental health at all ages.

TO BUILD SOUND TEETH foods must provide adequate calcium and phosphorus in good proportions and liberal amounts of vitamins D, C and A.

TO MAINTAIN SOUND TEETH AND HEALTHY GUMS these same foods are necessary.

The following table lists the most important foods for dental health:

Tooth Building and Tooth Protecting Foods	Desirable Amounts	Minimum Amounts	Cheapest Sources
Milk ***SUPPLIES** **Calcium** **Phosphorus** **Vitamin A** **Vitamin D in varying amounts**	**1 qt. daily for all growing children, expectant and nursing mothers.** **1 pt. daily for each adult.**	**1 qt. for expectant and nursing mothers.** **1 qt. for all children under 2 years.** **1½ pts. to 1 qt. for children 2 to 12 years.** **1 qt. for children 12 to 18 years.**	Grade B pasteurized. Evaporated Milk. Dried Milk Powder.
Leafy Vegetables **SUPPLY** **Calcium** **Phosphorus** **Vitamins A, C, D**	**2 to 3 servings daily for adults and children over 6 years.** **1 to 2 servings daily for younger children.** **Salads are best.**	**1 serving raw at least three times a week; daily if possible.** **1 serving cooked at least two to three times a week.**	Spinach, Escarolle, Dandelions, Beet Tops, Turnip Tops, Swiss Chard, Collards.
Other Vegetables **SUPPLY** **Smaller amounts of minerals and vitamins most essential for teeth**	**1 to 2 vegetables daily beside potatoes and leafy vegetables.**	**At least one vegetable daily beside potatoes and leafy vegetables.**	Potatoes, Dried Beans, Dried Peas, Carrots, Onions, Turnips.
Fruits **SUPPLY** **Vitamins C and A** **Calcium** **Phosphorus in varying amounts**	**1 to 2 servings of citrus fruit daily.** **1 to 2 servings of other fruit daily.**	**Orange or tomato juice daily for all children under 3.** **Raw fruit at least 3 times a week for others.** **Cooked fruit 2 to 3 times a week.**	Canned Tomatoes, Bananas, Apples, Oranges under 20c a doz. Others in season.
Cereals **SUPPLY** **Phosphorus** **Whole grains are best**	**Use whole grain bread or cereal at each meal in preference to white bread or cereal.**	**Whole grain bread or cereal once daily if possible.**	Yellow Cornmeal, Cracked Wheat, Oatmeal, Rice, Macaroni, White Bread.
Eggs **SUPPLY** **Calcium** **Phosphorus** **Vitamins A and D**	**1 daily for each child and adult.**	**3 to 6 a week for children under 6.** **3 to 4 a week for others.**	Storage Eggs. Fresh Eggs in spring and summer.
Meat and Fish **All kinds supply phosphorus** **Liver, oysters, clams also supply calcium and vitamin A**	**Meat or fish daily for children over 6 and adults.**	**2 to 4 times a week.**	Stewing cuts of Beef and Lamb; Pork, Ham; Canned Salmon, Dried Cod Fish.
Cheese **SUPPLIES** **Calcium** **Phosphorus** **Vitamin A in varying amounts**	**Use once or twice a week in addition to or as a substitute for meat.**	**Use once or twice a week in place of meat.**	Cottage Cheese. Domestic Cheese under 20c a lb.
Butter **SUPPLIES** **Vitamin A** **Some Vitamin D**	**Use daily on bread and in cooking if possible.**	**Daily on bread for children under 6 and others if possible.** **Other fats for cooking.**	Tub or Print Butter, Oleomargarines from animal fat, Peanut Butter, Lard, Suet.
Cod Liver Oil **SUPPLIES** **Vitamins A and D** **Or Concentrates of Vitamins A and D as suggested by physician**	**As directed by physician. Usually 3 teaspoons daily for children under 2.** **4 to 5 tablespoons a week for older children during winter.**	**2 to 3 teaspoons daily for children under 2.** **2 to 3 tablespoons a week for pre-school children if possible.**	Plain Cod Liver Oil by the pint.

* Only the dietary essentials most needed for dental health are listed. Each of these foods contain other essentials for good nutrition.

Prepared by Anna DePlanter Bowes, B. S. M. A.
In charge of Nutrition Education Philadelphia Child Health Society.
Lecturer on Nutrition School of Dentistry,
University of Pennsylvania and Temple University Dental School.

Fig. 2.—Diet sheet given to visitors after graphic exhibit of Pennsylvania Hospital Food Clinic had been explained to them.

with most of the foodstuffs used in the food exhibit. A little over $300 was spent, the balance to be turned over to the exhibit committee of the following year.

CAMPAIGN PUBLICITY

Precedents may be hard to break but they are still harder to establish. The exhibit committee had to steer a course midway between the suggestions of the conservative element, who were only lukewarm to the whole idea, and the radical group, who unwittingly wished to introduce all sorts of "circus stunts." It was important to keep in mind the fact that "it is but a step from the sublime to the ridiculous," and that only too often are the good effects of dental health endeavor nullified by its ardent friends who overstep the bounds of good taste. Because this was the first dental health campaign and exhibit undertaken in Philadelphia, it was decided to confine all publicity within dignified, professional lines.

The following mediums provided publicity for the campaign and exhibit:

1. Radio broadcasts.
2. Newspaper articles and published photographs of exhibits.
3. The board of education. Letters were sent inviting principals and teachers to attend and to inform pupils and their parents regarding the exhibit.
4. Invitations to parochial schools. Teachers in these schools brought their classes during school hours.

Fig. 3.—Pennsylvania Hospital Food Clinic Exhibit. Nurses were in charge to explain the exhibit to visitors.

5. Municipal and unofficial health agencies.
6. Church and fraternal organizations and women's and service clubs.
7. The local dental societies and dental hygienists' and dental assistants' organizations.
8. Personal letters sent by dentists to their respective patients asking them to attend. This afforded the dentists an opportunity to make contact with former patients.

Station WCAU, one of the largest in Philadelphia, offered its facilities gratis. The president of this station, himself a former practicing dentist, insisted that the public is not interested in listening to lengthy orations on dental subjects and that unless the talks were of a highly popular and entertaining nature, they should be confined to five minute periods regardless of the professional prominence of the speaker. A five-minute period on the Friday before the week of the exhibit was found to be long enough to allow the director of the exhibit to announce the time, place and purpose of the exhibit and to invite the public in the name of the profession of the City of Philadelphia. Because all preexhibit publicity was to a great extent a reiteration of this broadcast we give here the following excerpts from it:

The Dental Health Exhibit has been prepared especially for you under the auspices of the various dental organizations of Philadelphia and the Pennsylvania State Dental Society, as their personal contribution to the public dental health.

The purpose of the Exhibit is to show you in a simple and practical manner, in a way that all may understand, by the use of models, charts, photographs, and by actual demonstrations, just what one can do in order to have a healthy mouth and sound teeth. You will be shown the importance of mouth hygiene from the standpoint of health and appearance; what constitutes a proper diet to insure sound teeth, as well as the various procedures to be followed in combating dental disease and deficiencies according to the present day knowledge of dentistry.

You are constantly being reminded on all sides to visit the dentist. This time, it is the dentist who is personally inviting you to an exhibit where you may learn what you, yourself can do in order to obtain from those most useful organs, the teeth, the greatest benefit to your general well-being.

The importance of giving proper attention to the care of the teeth will become clear to you if you stop for a moment and consider

Fig. 4.—Exhibit of various foods in exact amounts containing calcium equivalent to the amount contained in 2 tablespoonfuls of milk.

the widespread attack of dental diseases. Recent investigations show almost 98 per cent of school children to have decayed teeth. Unless constant attention is paid to the care of the teeth, decay will almost invariably occur. No one can consider himself in good health when his teeth are neglected. Who of us in this enlightened age still believes that teeth are mere pegs stuck in the jaws? When we consider that the teeth are in close, intimate contact with the blood stream of the body, and that the same blood that goes to your teeth also goes to other and all organs of the body, and that infection from diseased teeth may be carried by the blood to any other part of the body, we realize that the teeth must be kept free from disease if we would preserve health.

Certain facts must be kept in mind if we would have sound teeth (and who, we may ask, considering their health and appearance, does not wish to have sound teeth?) These are: 1. We must eat foods containing sufficient minerals and vitamins. 2. We must brush the teeth regularly and in a proper manner. 3. We should take advantage of the service that dentistry has to offer. These and many other facts will be demonstrated to you at the Dental Health Exhibit by members of the dental profession who will gladly answer any questions that you may care to ask. You will be provided with literature outlining methods for the home care of the mouth and teeth so that you may help yourself to dental health.

Other broadcasts, including a playlet and a popular talk on diet, were made during the time of the exhibit.

In response to requests of a committee, and after due deliberation, the board of education decided not only to bring the exhibit to the attention of teachers and pupils, but also to send a letter on its own stationery urging teachers to attend as they could obtain at the exhibit much material in connection with health instruction work. A letter announcing the exhibit was sent to 500 public schools and 200 parochial schools. Invitations and announcements were also sent to medical societies, health organizations, child welfare societies, practicing physicians, nurses, health workers, social workers, women's organizations, churches, service clubs, parent-teacher organizations, dental hygienists, dental assistants and interested lay people in general. All

Fig. 5.—View of food exhibit showing sample menus for children of 2, 5 and 13 years.

letters were written on the stationery of the Dental Health Campaign and Exhibit, which carried the names of the committee.

During the campaign, the newspapers published articles, some prepared by the publicity committee, others written by reporters, showing photographs of individual exhibits and stressing the various features. The "women's page" of one of the largest evening newspapers featured the food exhibit in one of its issues. An exhibit showing the evolution of the toothbrush from the primitive wooden stick used by the African native to the modern sterilizable brush received a great deal of newspaper publicity. Reporters found that this exhibit had a great deal of reader interest and stressed it extensively.

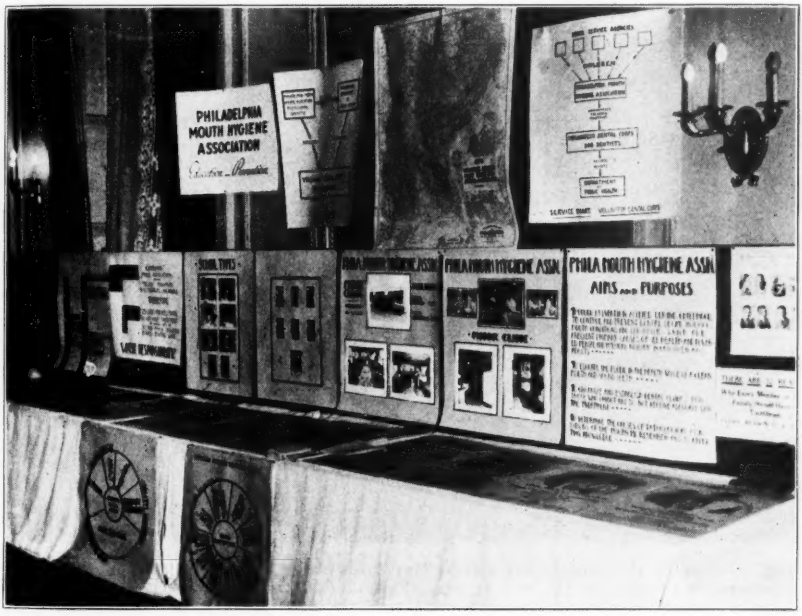


Fig. 6.—Exhibit of work of Philadelphia Mouth Hygiene Association and Volunteer Dental Corps.

THE DENTAL HEALTH EXHIBIT

Among the exhibitors were the following:

1. University of Pennsylvania. J. L. T. Appleton, Jr., presented a series of charts showing the daily fluctuation in the number of bacteria in the mouth and how this number is affected by the presence of food débris, by rinsing and by brushing with nonmedicated toothpaste; also charts showing methods for the care of the toothbrush. Le Roy M. Ennis showed roentgenograms of mouth lesions. Mrs. Anna De Planter Bowes distributed to visitors the diet chart shown in Figure 1.

2. Temple University. Frederic James presented charts, models and experimental animals, showing mouth diseases, tooth development and the effects of vitamin deficiency on dental health.

3. Pennsylvania State College. R. Adams Dutcher showed charts and photographs of experimental animals and human beings suffering from specific vitamin deficiencies.

4. Columbia University. Leuman M. Waugh presented an illuminated colored slide exhibit showing the effects of "white man's food" on the teeth and jaws of the Eskimo.

5. State University of Iowa. C. L. Drain had an exhibit of dental health posters.

A. Salzmann exhibited lantern slides showing tooth development and the effect of malocclusion and loss of teeth on the appearance of the face; also what orthodontia can do to correct facial deformities.

9. Pennsylvania Association of Dental Hygienists. Miss M. P. Krauser and her associates exhibited posters, models and charts and made an actual demonstration on patients of the work of the dental hygienist. The chart shown in Figure 2 was distributed to visitors.

Pennsylvania Dental Hygienists Association
Philadelphia District Society
IF EVER YOU WISH TO BE OF REAL SERVICE IN THE WORLD DO SOME THING FOR CHILDREN
PREVENTIVE DENTISTRY

Fig. 7.—Exhibit of Pennsylvania Dental Hygienists Association, showing patient receiving prophylactic treatment.

6. Philadelphia College of Pharmacy and Science. E. Fullerton Cooke showed the evolution of the toothbrush; ingredients commonly used in dentifrices and their hygienic or therapeutic value, and common mouth wash ingredients and their therapeutic and hygienic value.

7. Western Reserve University. T. Wingate Todd and B. Holly Broadbent presented charts showing methods and results of studies of child development.

8. Dewey School of Orthodontia. J.

10. Philadelphia Mouth Hygiene Association. R. Emerson Sausser, Gustav C. Tassman, and Mr. Thomas M. Temple presented material illustrating the aims and accomplishments of this organization, and the work of the Volunteer Dental Corps in cooperation with the Philadelphia Department of Health in providing free dental care for needy children, with a distribution of dental health facts.

11. Pennsylvania Hospital Food Clin-

ic. Miss Martha A. Alderman and her associates had a complete exhibit showing actual foodstuffs; the calcium equivalent of 2 tablespoonsful of milk contained in various food units; calcium and phosphorus requirements per day of an adult and of a child, with milk and without, and the foods from which these may be obtained. Specimens of adequate daily meals for children of 2, 5 and 13 years were shown, and the vitamin equivalents of various foods. All foods were weighed accurately and changed daily.

The exhibit was housed in a well-lighted corner room on the mezzanine floor of the Bellevue-Stratford Hotel. A stairway led directly from the hotel lobby to the exhibit room, making it unnecessary to tax the hotel's elevators. Signs were placed in the hotel lobby directing visitors to the exhibit. A corps of dental hygienists were trained to explain the various exhibits to visitors. The food exhibit was wholly under the direction of Miss Alderman and her assistants. The exhibit was open daily from 10 a. m. to 10 p. m.

RESULTS AND CONCLUSIONS

The inclusion of a health exhibit in the program of the annual meeting of the state society had the desired effect of impressing the public in a concrete manner with the relationship of dental care to general health preservation and disease prevention. Newspaper reporting of dental meetings often takes grotesque and fantastic turns, even when it does not resort to facetious treatment, as it so often does. The foregoing is true not so much because of the unfamiliarity of newspaper reporters with dental subjects, but because reporters find it extremely difficult to obtain material with reader interest from the highly technical and scientific discussions carried on at such gatherings. The health exhibit, arranged especially for the public, provided the reporters with a wealth of material, with the result that the whole tone of the publicity concerning the meeting was improved. A greater number of people read, thought and talked dentistry during the time of this meeting than ever before.

The mayor of Philadelphia, members of his cabinet, judges, educators and influential laymen visited the exhibit and carried away with them a new impression of the scope and aims of dentistry. Their interest was aroused in the health value of dental care. Parents were shown how they can help themselves and their children to dental health. Health talks and explanations of exhibits were varied to meet the intelligence of various audiences. Talks and explanations given to children differed from those given adults.

Dental health exhibits should not attempt to cover too much ground. The direct dental relation to the subject treated should be kept in evidence at all times. We believe that it is a mistake to treat dental health subjects in too light a vein. A straightforward statement of facts is sufficiently interesting in itself without resorting to drawings of teeth that talk in doggerel rhymes and molars beset by red devils. Such posters should be minimized, as there is danger that the whole thing may be taken too lightly.

An unexpected benefit was derived from the fact that practically all dentists attending the meeting made it a point to visit the exhibit. The interest of the profession itself was thus aroused and the fact impressed on them that they have a health message to transmit to their patient along with the customary service that they are called upon to perform.

66 East Sixty-Sixth Street.

MOUTH HEALTH TEACHING IN THE NORTH CAROLINA SCHOOLS

By ERNEST A. BRANCH, D.D.S., Raleigh, N. C.

A PHYSICIAN, George M. Cooper, connected with the North Carolina State Board of Health, was, as far as I am able to determine, the first public health official to place dentistry in a public health program. This was in 1918. North Carolina was one of the first states to have a dentist as a member of the state board of health, in 1919, and was the first state to enact a law making a dentist a member of every county board of health, in 1931. James M. Parrott, on his election in 1931 as state health officer of the North Carolina State Board of Health, dignified the profession in North Carolina by making the division of oral hygiene a separate and distinct entity of the board of health.

The purpose of the Division of Oral Hygiene of the North Carolina State Board of Health is not to operate free dental clinics, but to teach the value of oral hygiene in the prevention of disease.

The dentists in this department are trained as teachers and are capable of going into any classroom and teaching the subject of oral hygiene, which is based on foods, food values and proper health habits. In our didactic teaching in the classroom, visual methods are used; namely, models, placards, blackboard drawings, stereopticon slides, etc.

Dental corrections are also used as a means of visual instruction. The necessary dental work is done for as many children as possible, preference being given to grade repeaters. In this part of our program, before any work begins, the child is shown his own mouth in a large mirror and the existing conditions are explained. This gives the dentist-teacher an opportunity to reemphasize the health truths brought out in the classroom teaching. Of course, the number of children worked for is reduced to a minimum because we do not reach as many with actual dental work in this way as we would had all of our time been spent at the chair, but those who are fortunate enough to be used for demonstrative purposes have all necessary dental corrections made in the very best manner possible. Those who require dental attention and do not receive it in school are urged to visit their family dentists.

This method of teaching allows the grade teacher to correlate mouth health with "reading, writing and 'rithmetic," history, geography, spelling, etc. It is easily "tied in" with the projects and activities of farm agents, home demonstration agents, 4-H Clubs, golf clubs, home economics work and vocational agriculture, as these are all closely associated with foods, food values and proper health habits.

The financing of this activity is borne jointly by the state board of health and local budgets. Local budgets include schools, parent-teacher associations, civic clubs, etc.

The director of the division of oral hygiene is a dentist, and in addition to directing the activity, spends the major portion of his time lecturing in grade schools, high schools and teacher-training institutions, and before parent-teacher associations, women's clubs and civic clubs.

CAN THE BUREAU ASSIST YOU IN YOUR DENTAL HEALTH PROBLEM?

ACTIVITIES OF THE BUREAU

1. Develops friendly relations with other health agencies of a national, state and local character.
2. Acts in an advisory capacity to departments of health, health organizations and individuals interested in the development of mouth hygiene programs and clinical activities.
3. Collects and dispenses various types of data and information pertaining to dentistry, especially that dealing with dentistry in the public health field.
4. Distributes dental health educational material in pamphlet and poster form.
5. Conducts a motion picture film and lantern slide rental service.
6. Furnishes material for various types of dental talks to lay audiences and assists and advises in development of such talks including radio talks.
7. Prepares dental exhibits and has them available for national, state and local dental meetings as well as for various types of lay health shows.
8. Reviews any dental plans and outlines of proposed pamphlets and dental programs which are submitted to it.
9. Collects interesting articles on dental health for publication in THE JOURNAL of the AMERICAN DENTAL ASSOCIATION.

* * * * *

A list of dental health educational material developed by the Bureau of Public Relations for professional and lay use will be found on page 2110.

CURRENT LITERATURE

Fetor Oris (Halitosis), A Medical and Dental Responsibility (G. L. Grapp, Northwest Med., September, 1933): Fetor oris is usually attributed to gastro-intestinal or hepatic disturbances, suppuration of the lungs or a pyogenic process in either the nasal or the oral cavity. The author resolves the question into three phases: the source of the odor, the growth of micro-organisms, if any, responsible for the complaint and the material on which the biochemical process is perpetuated. Five hundred cases were examined and charted and the results were conclusive that the fetor was post-oral. Clinical observations showed that 90 per cent of the patients had a coated tongue. Here, the responsibility for the fetor was placed. The heaviest coating was at the base of the tongue, where the friction of the tongue, because of the smooth, contiguous tissues, was less. The thick accumulation of desquamated cells and their decomposition, the accumulation of organic matter plus the effects of the associated bacteria, gave origin to the fetor. This could be readily proved by the use of a swab. Contributing factors are improper diet habits, the use of alcoholic beverages, heavy smoking, nervous tension, organic and gastric disturbances. "Fur on the tongue" is the consequence of oral sepsis in varying degrees. Of the bacteriology of fetor oris, Grapp says, staphylococci, spirillae,

molds, diplococci, gram-positive and negative micrococci and bacilli have all been cultured. The micrococci and gastrobacilli thrive on necrotic matter and form toxic products of decomposition. The degenerative condition of the tongue cells is due to bacterial growth. The homogeneity of the bacteria of the tongue and the coliform bacilli of the feces is noted as a link in the metabolic chain. Grapp devised instruments for cleansing the tongue and applying a modified form of Dakin's solution in a jelly base flavored with essential oils. The jelly destroys bacteria without injuring the living tissues.

T.

Production of Experimental Plaut-Vincent's Angina in the Dog (Helena Wallace, E. W. Wallace and O. H. Robertson, J. Clin. Investigation, September, 1933): In 1931, one of the authors noticed that after the daily injection of scillaren B, dogs developed a mouth condition similar to Plaut-Vincent's disease. Smears from them showed the typical fusiform bacilli and spirochetes. This observation led to the experiments described in this paper. Eleven dogs were used, all of which developed a typical angina, pathologically and bacteriologically. Attempts were made to transmit the disease, the diseased animals being allowed to run in the same room with the disease-free animals and to eat from the same pan, but the healthy ones did not contract the disease. Swabs infected from the pockets of affected teeth were inserted under the gum margins of the healthy dogs without effect. Cultures were taken from the infected mouths and grown anaerobically. The fusiform cultures were readily isolated. Spirochetes refused cultivation. The writers have no explanation to offer for the effects of scillaren B injection except its possible disturbance of metabolism.

T.

Cancer of the Tongue, Its relation to Buccal Lesions and Its Therapy (Professor Proust, Odontologique, August, 1933): Proust lists the possible causes of cancer of the tongue under physical, chemical and parasitic irritation. Under physical irritation, he names irregular teeth, ineffective hygiene, and repeated burns; under chemical, tobacco; under parasitic, spirochetes, which first cause leukoplakia. At this point, he emphasizes prophylactic possibilities and the importance of early diagnosis. The last fifteen years have brought about a decrease in cancer. He discusses the lymphatics of the tongue, which must be understood to determine the paths of propagation. Success in therapy is determined by early treatment of lesions and lymphatic surroundings. Interstitial beginnings of cancer are hard to diagnose as they make no surface lesions, only nodules. This type is less common. The more frequent make superficial lesions, giving rise to epithelioma or leukoplakic areas. Electric bistoury should be used to remove plaques in early stages. Pain in the area at night and excessive salivation are symptomatic. Therapy should be prompt. He mentions radiotherapy and electric therapy, but advises surgery in preference in early stages. He discusses the technical difficulties of radiotherapy in detail. It supplants mutilating surgery. In later stages, he encourages penetrating roentgenotherapy as it sterilizes surrounding tissues to an extent equivalent to extensive surgical procedure.

T.

Extraction of Teeth in Acute Inflammation (Jean Veyrasset, Rev. Odontol., August, 1933): There is an old prejudice against extracting teeth that have provoked osteocellulitis. The presence of cellulitis constitutes an absolute contraindication. To it are attributed all accidents attendant on extraction, without search for other causes. Sebileau and Truffert have both advocated intervention. The arguments against intervention are possible hemorrhage and alveolitis. The author speaks from thirty years' experience in the surgical Policlinic. He says: "Extraction should be made immediately. It cures without need of additional medication." He has never experienced a phlegmasia. All accidents seen have been due to the use of local anesthetics for palliation and without suppressing the pain of extraction. Local anesthetics should never be used in these circumstances. He quotes widely in support of his contention. He insists that injection spreads the infection by purely mechanical means and their chemical action causes vasoconstriction, which inhibits the normal physiologic defenses, leaving the area a prey to the prevailing infection. The misdeeds attributed to the use of procaine are multiplied by the action of the adrenalin. A tooth which has inaugurated an inflammation should be extracted, preferably with no anesthetic. It should never be retained. The best drainage is produced by extraction. Vac-

cines are uncertain. Surgical intervention is at present the last resort, first and last.

T.

Apical Paradentitis of Deciduous Teeth and Its Effect on the Tooth Germ of Permanent Teeth (W. Bauer, Ztschr. f. Stomatol., 1932, pp. 721-730): The inflammatory changes which arise from the wide and enlarged pulp space of the deciduous teeth and which penetrate into the adjacent tissue of the tooth germs are different in their effect from similar changes in the permanent teeth. The author found the development of localized enamel hypoplasia in the underlying tooth germ and an osteitis near the inflamed regions of the root apices of the deciduous teeth. Bauer presents these findings as a confirmation of his view expressed in his earlier works on rickets, scurvy and syphilis that enamel hypoplasia is a true defect that is produced by an injury of the ganoblasts associated with various circulatory disturbances. The early treatment of deciduous teeth will prevent the development of a paradentitis. If the latter has spread in the region of the apices, the teeth should be removed.

S.

Experimental Scurvy in Guinea-Pigs, with Special Reference to the Dental Findings (A. Wagner, Deutsche Monatschr. f. Zahnheilk., 1932, pp. 721-745): Scurvy was produced in the guinea-pig by three known diets. The earliest symptom was the loosening of the molars. Roentgenographic and histologic studies showed that the probable cause for the loosening was partly resorption of the alveolar bone and partly changes in the periodontium. The diet of Holst and Frolich was found to be best for the simple, rapid and inexpensive production of scurvy in guinea-pigs.

S.

Experiments on Metallic Magnesium as a Root Canal Filling Material (H. Wilhelms, Deutsche Monatschr. f. Zahnheilk., 1933, pp. 1-28): The author used metallic magnesium as a filling material in a large number of clinical cases and made the following observations: 1. Magnesium presents no difficulties in the preparation of a root canal filling material. It may be used easily either as a paste or as a metallic point. The canal is fully filled and the paste adheres to the walls. 2. In water solutions, there is a change in the magnesium with the liberation of hydrogen. The addition of acids, alkalies or salts increases this reaction. There occurs an oligodynamic reaction with magnesium. 3. Subcutaneously implanted magnesium points in rats are fully absorbed in one month's time. The decomposition of magnesium is brought by cell activity and by absorption. In place of the absorbed metal, scar tissue is formed. 4. Roentgen rays penetrate magnesium without difficulty. Clinical observation shows that the absorption of magnesium in the periapical tissues occurs without any obstacles. The decomposition of the part of the point passing through the apical foramen in an overfilled canal takes place within three to four weeks. 5. Whether magnesium remains permanently as a filling in the canal, and whether closure of the apical foramen takes place through scar tissue formation or cementum formation, the author cannot tell from his investigations. A histologic investigation is necessary to establish this.

O. K.

Physiology of Healthy and Diseased Teeth. Chronaxia of the Sensory Nerve Endings in the Healthy Tooth (R. Weber, Deutsche Monatschr. f. Zahnheilk., 1933, pp. 769-775): Chronaxia is the minimum time required for a current double the rheobase to stimulate. The author describes his apparatus and the method used for the determination of chronaxia of teeth. In order to determine an average chronaxia of all healthy teeth, he examined 100 normally formed sound teeth, free from any fillings or defects in enamel. The patients examined were from 18 to 25 years of age. Three groups of teeth with different values in chronaxia were established: (1) molar group; (2) lower anterior group, and (3) upper anterior group. The bicuspids show variations. They can be included either in the molar group or the anterior group. It often happens that the first bicuspids belong to the anterior group, while the second bicuspids belong to the molar group; the same conditions are present in both right and left sides, but variations exist as to upper and lower arches. The molars show the shortest chronaxia; the lower anterior teeth have a shorter chronaxia than the upper anterior.

O. K.

Structural Changes in the Paradentium Under Traumatic Influence (Professor Adrion, Deutsche Monatschr. f. Zahnheilk., 1933, pp. 98-117): Histologic and roentgen-

ographic studies show that excessive function and traumatic mechanical influences may cause fractures of cementum on the root surfaces. It is essential, therefore, that strong fibers of the periodontal membrane be firmly attached in the alveolar bone. These fractures occur most frequently at the dentinocementum junction. They may also occur between the cementum and the dentin. The fractured parts on the root surface attempt to maintain their normal functional relations with the bone, but they may be further displaced under the functional influences. The healing process resembles that of healing of a bone fracture. A complete healing does not occur. Under favorable conditions, a regeneration of the wound on the root surface takes place and also a functional enclosure of the splinter by healing over, and a formation of a new periodontal space in the fissure. Healing may be hindered by inflammatory processes and epithelial proliferation.

O. K.

Multiple Sinus Infections of Dental Origin, Combined with Ozena, with Fatal Outcome (Ove Brinch, Tandlaegebladet, July, 1933, p. 425): Brinch's case is very interesting as it is possible to follow the development of the condition from the beginning to the end: the post-mortem examination.

The infection which started around the apex of an upper right cuspid produced a perforation into the right maxillary sinus, and spread to the other nasal sinuses, causing a particularly bad case of frontal sinusitis with atrophic rhinitis and ozena. Later, the infection spread farther, producing a bilateral otitis media, as well as a slight arthritis. Later, there was a cough and shortness of breath, and the patient died with a right bronchial pneumonia. The case is well presented. All the roentgenograms and models are shown, as well as the necropsy findings and the complete microscopic evidence of the development of the infective process from the upper right cuspid.

E. G. J.

Hemiatrophia Facialis Progressiva Treated with an Expansion Appliance in the Oral Cavity (Hilmar W. Boe, Norsk Tannlegefor. Tid., May, 1933, p. 197): The case reported by Boe is unique, being the only case reported in medical literature, wherein definite response to any formal treatment has been found. The patient showed the first symptoms of a left facial atrophy at 8 or 9 years of age. From then on, she was under practical care for about thirty years, having several operations performed to improve her appearance. In spite of all care, the condition grew worse. In 1930, at the start of the treatment, her condition was as follows: the skin on the left side of the face was very tight on the facial bones, which were much reduced in size. The same atrophy was present in all other tissues in the area, fat, muscle and connective tissue. The skin was yellow. The zygomatic arch had disappeared. The ramus of the mandible was involved in the atrophy, but not the body of the mandible. The muscle atrophy was particularly noticeable in the muscles supplied by the fifth nerve: temporalis, masseter and buccinator. The left side of the face was immobile. No wrinkles could be produced in the forehead and the left eye could not be closed.

A partial denture was constructed for this patient, the left side of which projected much farther lingually, that is, posteriorly, and buccally than usual. This excess of vulcanite was hoped to produce enough irritation on the overlying tissue to increase metabolism in this area. One year later, a new denture was made, the left wing being constructed considerably larger than previously. One year later, "the patient could hardly be recognized," and at present, all the atrophic tissues have regenerated to a considerable degree. The patient's color is normal and the eyebrows have reappeared. She can close her left eye and her mouth, and all wrinkles and grooves in her face have disappeared. She can move the left side of the face almost as well as the right

E. G. J.

MISCELLANY

BOOK REVIEWS

Food Nutrition and Health. E. V. McCollum and J. Ernestine Becker, published by the authors, East End Post Station, Baltimore, Md. Price, $1.50.

This is the third edition. The introduction has been entirely rewritten. Vitamin G has been added. (The British call vitamin G, B_2.) The book throughout contains evidence of having been done over. The object mentioned in the preface "to set forth in simple language the nature of an adequate diet as the biochemist sees it" has been accomplished. McCollum's name alone is sufficient assurance to any reader that the text is dependable.

T.

Local Anesthesia in Dentistry. By Guido Fischer, translated by Louis I. Grossman. Published by Lea & Febiger, Philadelphia. Price, $4.

This volume of 215 pages and 150 illustrations is the fourth edition. Its foreword is written by Hermann Prinz, which is significant enough, were the book by a less well known writer than Guido Fischer. Prinz says, "The beginner will find it as elementary as he might wish—the practitioner will find it as comprehensive and advanced as his needs require." Reading the text, one is convinced that the foregoing quotation is unmodifiable. It is a treatise on local anesthesia—nothing more, but that in detail and completion. No unnecessary material is included, no useless definition of parts, words, that even the half trained know. Fischer does not reduce his work to the point where "pressing a button for light equips one to handle the lighting system." He has a full awareness of his responsibility in directing his readers in the technic, requirements, possibilities and dangers of surgery. The student who masters this volume should be enabled to approach his task with understanding, composure and assurance. The edition has been brought up to date in every respect. T.

Trattato di Odontologia per Medici e studenti (*Textbook of Dentistry for Physicians and Students*). By Professor Dr. Silvio Palazzi, Director of the Dental Institute of the Royal University of Padua (Italy), with a preface by Prof. Dr. Amedeo Perna, Director of the Dental Clinic of the University of Rome and of the George Eastman Institute; second edition, 2 volumes, 1465 pages with 1665 illustrations. Price, 150 lire. Publisher, Dr. Francesco Vallardi, Milan, 1932.

From time to time throughout the world, textbooks or handbooks appear that give the entire dental knowledge of their time in a comprehensive and practical form. Since the war, several such works have been published in Europe; for example, the recent edition of Scheff's "Handbuch der Zahnheilkunde," published in Austria, and the monumental "Handwörterbuch der gesamten Zahnheilkunde" ("Encyclopedia of Dentistry"), edited by Kantorowicz, in Germany. (THE JOURNAL, 1930, p. 552; 1931, p. 766; 1932, p. 531.)

Now a similar work has appeared in Italy. Its author, Palazzi, is particularly well qualified for his task with his experience in dental teaching and research, and with his thorough command of English, German and French besides his mother language, Italian, which enables him to read the world's dental literature in the original and to keep up with the progress of dental science. We also must not overlook the fact that while most large dental textbooks or handbooks, like the ones mentioned above, are the product of the combined efforts of several dental authorities, Palazzi wrote his book without collaborators, and he alone dealt with all the different phases of dentistry.

Italy is one of the countries in which a degree of doctor of medicine is a prerequisite for the practice of dentistry. This fact is clearly brought out by the appendix at the end of Vol. 2 of Palazzi's work. This appendix deals briefly with the teaching of dentistry in Italy and in other countries, and we learn from it that in Italy, Austria, Hungary, Russia, Czechoslovakia and Roumania, the medical degree followed by some special dental training is required for the dental practitioner; whereas, all other nations give special dental education and a special degree. It is obvious, therefore, that Palazzi's

book, intended for physicians and medical students who will devote their time and efforts to the treatment of dental diseases, must necessarily be confined largely to purely dental subjects. A knowledge of the basic sciences—general anatomy, histology and pathology—is taken for granted. Still we find, in the first volume, a good and comprehensive description of the oral and facial bones and soft tissues. This is followed by a discussion of dental histology, using the most modern investigations and publications on this subject. Illustrations of Euler, of Meyer and of Orbán are reproduced, together with Palazzi's own very good photomicrographs.

The chapters on dental anomalies and on dental caries compare favorably with the discussions of these subjects in the leading American and German dental texts. The diseases of the pulp occupy considerable space in the present work, since Palazzi himself is well known for his experimental investigations of pulp changes under silicate cements, in case of pulp exposure, and similar problems. The new investigations concerning the epithelial attachment (*attacco epiteliale*) and the gingival crevice are taken up at length, also the problem of influence of function on the surrounding and supporting structure of the teeth. In the chapter on periodontal disease, Palazzi mentions the principal ideas on this subject in various countries, using Gottlieb's investigations as a starting point. The last chapters of the first volume deal with anesthesia, dental roentgenology, preventive dentistry and oral hygiene, the principles of operative dentistry and therapeutics. Attention should be called to the chapter on physical therapy (roentgen rays, diathermy), which illustrates the most recent developments in this particular field of general and dental therapeutics.

The second volume deals with surgery, oral pathology (other than dental), prosthetics, orthodontia and ceramics. Although the latter chapters contain subjects with which the American dentist is not especially familiar, Palazzi must be highly commended on the arrangement of the material and the enormous amount of work involved in this attempt to cover all the dental literature of two continents and take the best from everywhere and present it in a form that is well suited to the needs of his own country. The average dental practitioner or student of dental problems is hardly capable or willing to study all the advances of dentistry in his own country, and still less those of foreign countries. From a book like Palazzi's, he can derive much benefit; for Palazzi not only has performed this task for him, but also has used wise and careful judgment in separating the wheat from the tares, and thus presents what he considers to be of permanent value.

RUDOLF KRONFELD.

INCREASED COST OF GOLD

This is a synopsis of the principal features submitted to the officials of the American Dental Association and others in mimeographed letters of September 2, 9 and 26. In these, I reviewed the Executive Orders of August 28 and 29 creating a new Federal Gold Policy and incorporated therein a telegram to the President and a letter to the Secretary of the Treasury, setting forth arguments in support of recognizing gold as an essential material in dental health service and emphasizing that this increase would work a distinct hardship on the public. Subsequently, we ascertained from the Treasury Department that there was absolutely no hope of any modification in this respect, and that these Executive Orders were promulgated to meet an artificial gold situation and to stimulate an increased interest in the mining of new gold. This will meet the demands for gold, including the requirements of the industries, professions and arts and at the same time conserve the Federal monetary gold reserve.

It should be fully recognized that this increase relates only to fine gold, and for that reason all advanced prices should be based on the gold content of the various items. It is the avowed purpose of the Committee on Legislation and Correlation, as representing the American Dental Association, to vigorously protest any unnecessary advancement in the cost of dental gold and its alloys, since we recognize that any increase in dental fees will be detrimental to the welfare of the public and the best interests of the profession, as well as of the manufacturer. In fact, conditions are such that we respectfully urge that, until the economic conditions are greatly improved, the profession, the manufacturers and the laboratories absorb as much of every item of increased cost as is possible, in order to bring about a somewhat normal condition in dental practice.

There are different interpretations as to

how this new gold policy affects the dental profession, but after carefully studying all its phases and conferring with officials in the Treasury Department, the following is submitted as my definite conclusions:

1. A dentist whose gold supply, including scrap, does not exceed $100 is not required to keep any record or file any affidavits regarding the disposition of his gold. Explanatory: If he has $100 worth of gold purchased at retail price and scrap gold, at an approximate price of same, on hand on the first day of the month and uses some definite percentage of this by the tenth or fifteenth day, he can then purchase an additional supply, but must restrict this to a total amount on hand of not exceeding $100. Otherwise, he must obtain a license and meet the exacting requirements provided thereunder. In view of this, it is fair to assume that no dentist will find it necessary to have more than $100 worth of gold at any time.

2. A dental dealer who only sells gold direct to dentists, wherein no fabricating or processing is involved, is not required to keep records of persons to whom gold is sold or to file affidavits relative to such transactions, provided his gold supply does not exceed $100. Furthermore, a dental laboratory whose gold supply is restricted to $100 would also be exempt, but it is fair to assume that no dental dealer or laboratory worthy of the name can function under such limitations.

3. All persons having a gold supply of more than $100 at a time are required to secure a license, and Forms TG-4 furnish the necessary data connected therewith. These can be secured from any mint or assay office. These offices which are located in Philadelphia, Denver, San Francisco, Seattle and New York City. No reports will be required under new gold regulations prior to Oct. 15, 1933.

Respectfully submitted,
HOMER C. BROWN, *Chairman,*
Committee on Legislation and Correlation,
American Dental Association.
609 Hartman Building,
Columbus, Ohio,
Oct. 11, 1933.

CORRESPONDENCE

"ANOTHER ANGLE OF THE HAYDEN-HARRIS CONTROVERSY"

To the Editor:

The Horace H. Hayden-John Harris controversy, as it is intermittently appearing in the *Dental Cosmos,* is progressing well enough and has no apparent need for further aid or interference. From the evidence presented on either side of the issue, there can be no conjecture that the participants in the polemics are extraordinarily informed and equipped to defend their views (allowing for personal inferences). Such a discussion, even though somewhat colloquistic, serves a definite and merited purpose, at least for those who have no occasion to engage in a diversified study in the many branches of dentistry. In short, sincere and well investigated controversies are a beneficial source of information to the average practitioner.

Reluctant as I am either to engage in or to turn attention from the subject at issue, my curiosity is aroused by what appears to be an added phase of the subject which is possibly pertinent to this discussion. Reviewing the literature of early American dentistry, I was particularly impressed with the treatise on early dental surgery by Samuel Sheldon Fitch, M.D., entitled, "System of Dental Surgery in Three Parts," published by G. & C. & H. Carvill, 108 Broadway, New York City, in 1829.

I venture to appraise the work of Fitch as an outstanding contribution to early American dental literature, for, in that period, American dentistry had not reached the same degree of development that it had in France and Great Britain. Save for the more detailed dissertation on the diathesis of dental caries, his experiences and observations may be considered comparable to the works of Chapin Harris, Magitot, John and Charles S. Tomes and many others of a later period. To discuss Fitch is not merely to give an account of a pioneer in American Dentistry, —and on reading his book, his scholarly attainments and versatility in dental history and dental literature become immediately obvious. With all his accomplishments, there remains a very poignant question. He quotes other authors freely and avails himself of an unlimited number of references, almost international in scope. That no mention is made of the names of Harris or Hayden in his references is particularly noteworthy since the leaders of American dentistry were presumably not too numerous at that time. (System of Dental Surgery in Three Parts, page 561 gives his "list of books," including a list of his American conferees and correspondents.)

If one is to attempt to associate the present

controversy with the life and activities of Fitch, the following question arises: Was Fitch unaware of the activities and contributions to dentistry by Harris and Hayden? On page 22 of his book, Fitch says, "In this country no extensive work has ever been published on Odontotechny. To Eleazar Parmly of New York we are indebted for a popular essay upon this subject, containing some valuable information. Mr. Flagg of Boston and Mr. L. S. Parmly have favored us with their views upon it." He further cites the fact that other sources of information were the medical journals, where "some valuable papers upon different parts of our science" were published. It is particularly significant that of the earliest American dental educators, he mentions only the following contributions:

"A Treatise on the Human Teeth, Concisely Explaining the Structure and Cause of Disease and Decay," by Skinner, New York, 1801.

"Lectures on the Natural History and Management of Teeth," by L. S. Parmly, 8 volumes, New York, 1821.

"Observations of the Teeth," by Flagg, Boston. (No date given but presumably of that same period.)

"Tic Douloureaux," by Trenor, New York, 1824.

"Structure, Organization and Nourishment to the Teeth," by Trenor, New York, 1826.

"Observations upon the Importance of the Teeth," by Samuel S. Fitch, 8 volumes, Philadelphia, 1828.

It is, therefore, with no thought of impropriety that I venture to engage in the already well treated and ably covered discussion, but I feel that to submit further evidence from another point of view may in no way detract or deviate from the issue in question. Another phase of the question: If pioneering in American dentistry and dental education is the issue, may there not be a likelihood that Fitch himself may be credited for the rôle he played as a dental educator precisely at the time of Hayden and Harris?

SAMUEL RABKIN,
711 Doctors Bldg.,
Cincinnati, Ohio.

"THE CLINICIAN"

To the Editor:

Did you ever give a clinic at the "National"? Get a thrill out of it? So did I . . . up to the time I arrived in the convention city.

To begin at the beginning, I first started preparation for my clinic about six months in advance of the date set for the meeting.

I remember the telephone call from the chairman of our state clinic committee. Certainly I would take part in the program. "Glad to. After a fellow has had ten years of active practice, he ought to be willing to discuss some of his pet interests. What was that? Oh! The state wants at least four clinicians. Very well—25 per cent of the program is all set."

A few days after that call, I dashed off to the nearest city medical library to brush up the theory of my subject. Got to have it down pat you know. Agonizing hours, wishing I had passed up football and "petting in the park" for more German and French. Why don't they give us dumb fellows translations of German papers anyhow? Ninety-five per cent of the stuff I needed was in the language of the Teutons.

But I got it. The next step was a series of clinical tests to brush up on the practical value of my subject, after which I made a trip to the office of a practitioner 150 miles away to check on his results. This was going to be real stuff. You could walk up to my clinic and take something away with you.

As the time approached, I went to New York to arrange with the manufacturers of the equipment that I was to demonstrate for a shipment of the equipment to the convention city.

Just before drawing out the $250 needed for the trip, I decided my last year's suit wouldn't do for a big thing like this. No sir! Something to fit the 1933 chest was absolutely essential.

There's nothing like a new suit to show off your "clinician" blue ribbon. My thrill reached its zenith when I tacked on this important looking label. Shortly after my decoration, I found that hotel accommodations were inadequate and I would have to stay in the boat on which I had arrived and depart with it. But the boat was to leave on Thursday and my part of the program was scheduled for Saturday.

What could I do? Finally, I had the wholly naive idea that the clinic committee would rearrange the program a bit so that I could edify the mob on Wednesday. After twenty trips to the room supposed to house the clinic committee and many long hours of waiting, I got the ear of the master mind. He was a nice fellow, or would have been

if he had been allowed to get some sleep in the last five days. I stated my dilemma.

"Are you sure you are on the program somewhere—I can't seem to find your name—Oh, yes! Here it is; you're 968. I'm so sorry, we couldn't get your placard out of the Saturday group in time for Wednesday."

"But," I suggested, "I don't mind not being placarded (liar), just so long as I get my program in."

"Sorry, doctor, we can't do it; it's been hot, hasn't it—sticky too—hey, Bill, did you get those cops straightened out?"

It was a very tiresome trip home. A few days after returning, I received a letter from the Secretary of the Congress. It will always be kept as a cherished memento. It reads:

"Dear Doctor:

"It is the wish of the Officers and Board of Directors of the Dental congress that I express to you our sincere appreciation and thanks for your contribution to the program of the congress.

"The success of any meeting reflects the effort and cooperation of its participants and we feel that your splendid presentation was an important contributing factor.

"The membership of the local society, under whose auspices the Congress was held, is similarly grateful and wants you to know that if at any time we are able to serve you it will be a pleasure to do so.

"Sincerely yours,

Secretary of the Congress,"

R. Bullock Jones,
702 Main St.,
Willimantic, Conn.

NEWS

Dr. Prinz Accorded New Honors in Germany: Hermann Prinz, professor of pharmacology at the School of Dentistry, University of Pennsylvania, was appointed a fellow of the Kaiserlich Lepoldinisch-Carolinisch Academie der Naturforscher located at Halle a/S, July 20, 1933. The Akademie, the oldest of its kind in the world, was founded in 1652. Dr. Prinz is the first dentist in the United States ever to be elected to membership and is one of the five dentists members of the academy, the other dentists being Walkhoff and Schroder of Berlin, Euler of Breslau and Hess of Zurich. In all, there are about thirty-five members in the United States including Prof. Chares Frazier, chief surgeon of the University Hospital, Cushing, Welch, Wells, Hess, Henderson, McCullen, Mendel, Folin, Hunt, Bunting, Cannon A. Flexner and S. Flexner. Since the founding of the Akademie 281 years ago, many immortals of science have been included in its membership. The name of Dr. Prinz will take its place along with those of Agassiz, Berzellius, de Candolle, Celsius, Cuvier, Darwin, Goethe, Haller, v. Humbolt, Koelliker, Liebig, Linnaeus, Lyell, Siemens, Thomson, Virchow and Weber. Dr. Prinz holds an honorary A.M. degree from the University of Michigan, an honorary Sc.D. from Pennsylvania, a Dr. Med. Dent. from Cologne, a D.D.S. from Michigan and an M.D. from Marion Sims Medical College. The Callahan award and the Jarvie medal were awarded Dr. Prinz and he was honorary president of the section on materia medica at the Fifth and Seventh International Dental Congresses.

Release of the U. S. Pharmacopeial Reference Cod Liver Oil of Known Vitamin A and D Potency: The U. S. P. Vitamin Advisory Board has just released the "Reference Cod Liver Oil" of known vitamin potency for use in the standardization of cod liver oil and other products containing vitamins A and D. This "reference oil" has been assayed through a cooperative program, including fifteen vitamin laboratories, in which the international standards for vitamin A and vitamin D were used as a basis of comparison. The potency of this "reference oil" has therefore been established upon the basis of international units and it is available for use in the standardization of all vitamin A and vitamin D products, both medicines and foods. The method of assay used in the determination of the potency of the "reference oil" is that proposed for adoption by "interim revision" for the U.S.P.X. The original draft of the assay, as used by the laboratories participating in the preparation of this standard, is also available through the chairman of the U.S.P. Committee of Revision. Within a short time, this assay and the revised text for cod liver oil to be established by "interim revision" will be officially announced. This revision will establish the new Vitamin A and vitamin D potency for official cod liver oil. The standard "reference oil," of known vitamin potency, is supplied in 30 c.c. packages. One lot of the oil has been assayed for its vitamin A potency, another lot for its vitamin D activity. A nominal charge of

$2.50 will be made for each 30 c.c. package. These may be secured in individual packages or in any larger number desired, by addressing the Chairman of the U.S.P. Committee on Revision, 43rd Street and Woodland Avenue, Philadelphia, Pa.

Deaths

Jones, Robert Young, Birmingham, Ala.; Vanderbilt University, School of Dentistry, 1888; died, September 3; aged 70. The widow and one son survive.

Krieger, Emanuel, Baltimore, Md.; University of Maryland School of Dentistry and the Baltimore College of Dental Surgery, 1913; died, of coronary thrombosis, September 12; aged 45. The widow, a son and a daughter survive.

Norman, Sara C., Chicago, Ill.; Northwestern University School of Dentistry, 1903; died, September 9; aged 68. A son and a daughter survive; also a sister, Alice Corey, M.D., of Chicago.

Sandy, Benjamin, Minneapolis, Minn.; University of Minnesota, College of Dentistry, 1902; died, July 20, after an illness of seventeen months; aged 54. The widow and a daughter, Janet, survive. Dr. Sandy was a former president of the state society and of the state board of dental examiners.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Board of Orthodontia, Oklahoma City, Okla., November 6-7.

American Dental Society of Europe, Holland, August, 1934.

American Society of Orthodontists, Oklahoma City, Okla., November 8-10.

Dental Protective Association, Chicago, December 18.

Greater New York December Meeting, New York City, December 4-8.

International Congress of Radiology, Zurich, Switzerland, July 24-31, 1934.

Odontological Society of Western Pennsylvania, Pittsburgh, November 14-16.

Society for Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

STATE SOCIETIES

December

Ohio, at Columbus (4-6)

May

Illinois, at Springfield (8-10)
New York, at Buffalo (9-12)

STATE BOARD OF DENTAL EXAMINERS

California, at San Francisco, December 11. K. I. Nesbett, Secretary, State Bldg., Annex, San Francisco.

Colorado, at Denver, December 12. N. C. Gunter, Secretary, 610 Thatcher Bldg., Pueblo, Colo.

Connecticut, at Hartford, November 22-25. Almond J. Cutting, Recorder, Southington.

Delaware, at Wilmington, January 17-18. W. S. P. Combs, Secretary, Middletown.

Massachusetts, at Boston, November 13-15. W. Henry Grant, Secretary, Room 141, State House, Boston.

Rhode Island, at Providence, December 12-14. Albert L. Midgley, Secretary, 1108 Union Trust Bldg., Providence.

Texas, at Houston, December 11-15. J. T. Edwards, Secretary, Medical Arts Bldg., Fort Worth.

Wisconsin at Milwaukee, December 11-15. S. F. Donovan, Secretary, Tomah.

DENTAL PROTECTIVE ASSOCIATION

The annual meeting of the Dental Protective Association of the United States will be held at the Palmer House, Chicago, December 18, at 4 p. m. The report of the officers will be given, a board of directors will be elected and such other business transacted as should come before the association. All members are urgently requested to be present.

By order of the Board of Directors.

E. W. Elliot, *Secretary*
55 E. Washington St.
Chicago

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of The Journal.

STATE OF RHODE ISLAND BOARD OF REGISTRATION IN DENTISTRY

A meeting of the Rhode Island Board of Registration in Dentistry for the applicants for license to practice dentistry and dental hygiene will be held at the State House, Providence, December 12-14, beginning each day at 9 a. m. Candidates shall present to the secretary of this board, at least ten days before the examination an application with fee and photograph. For applications and further information, address

ALBERT L. MIDGLEY, *Secretary*
1108 Union Trust Bldg.
Providence

DENTAL SOCIETY OF THE STATE OF NEW YORK

The Dental Society of the State of New York will hold its sixty-sixth annual meeting, May 9-12, at the Hotel Statler, Buffalo. H. J. Burkhart, 800 E. Main St., Rochester, is chairman of the program committee; Emory Thompson, 333 Linwood Ave., Buffalo, chairman of clinics, and Paul W. Zillman, 29 Walden Ave., Buffalo, chairman of exhibits.

A. P. BURKHART, *Secretary*
57 E. Genesee St.
Auburn

GREATER NEW YORK DECEMBER MEETING

The ninth annual session of the Greater New York December Meeting will be held in the Hotel Pennsylvania, December 4-8, under the auspices of the First and Second District Dental societies. The meeting will open with joint sessions of physicians and dentists under the auspices of the local branches of the New York State Medical and Dental Societies in Greater New York. A fee of $5 will admit to all lectures and to two registered clinics each on December 5, 6 and 7. A health and educational exhibit will continue throughout the meeting. Requests for clinic programs should be addressed to Miss E. M. Davies, 2 East 103d St., New York City, after November 12.

CARROLL B. WHITCOMB, *Chairman*

REPRINTS OF DENTAL PAPERS OF C. U. AND C. D. O. S. MEN WANTED

Prominent space will be obtained at Columbia University, School of Dentistry, for the display of the contributions of the graduates of Columbia University and College of Dental and Oral Surgery during the annual alumni day reunion, held February 12. It is earnestly desired that all C. U. and C. D. O. S. graduates who have contributed to dental literature send reprints to the undersigned. Please state thereon year of graduation; also list nonavailable contributions. Please state whether reprints are to be returned or contributed to school or library.

DENTAL ALUMNI ASSOCIATION OF C. U.
BENJAMIN B. KAMRIN, *Vice President,*
1450 Fifty-Second St.
Brooklyn, N. Y.

MOUNT SINAI HOSPITAL LECTURE COURSE

The third lecture course on dental medicine will be held at Mount Sinai Hospital, New York City, on the second Tuesday of each month from October to April. All lectures start at 8:30 p. m. All ethical physicians and dentists are invited.

HARRY A. GOLDBERG,
Chief of Dental Staff

IOWA STATE DEPARTMENT OF HEALTH, BOARD OF DENTAL EXAMINERS

The next examination of applicants to practice dentistry in Iowa will be held at the State University of Iowa, College of Dentistry, Iowa City, December 11-14. Applications properly executed, together with college diploma and fee of $25, must be filed with the state department of health at least fifteen days prior to date of examination.

IOWA STATE BOARD OF DENTAL EXAMINERS
HARDY F. POOL, *Secretary*
Mason City

BUREAU OF PUBLIC RELATIONS

AMERICAN DENTAL ASSOCIATION

212 East Superior Street
Chicago, Illinois

DENTAL HEALTH EDUCATIONAL MATERIAL

Dentists will find some of this material excellent for their waiting room table, and for use at the chair in educating both parents and children. *Education is the basis of preventive dentistry.*

Hygienists, nurses, teachers and public health workers will also find that much of this material will assist them greatly in their health activities. *Education is fundamental in public health work.*

Pamphlets on Mouth Health

1. Children's Teeth—How to Use and Keep Them Pt. I (Deciduous Teeth)..... 5c
2. Children's Teeth—How to Use and Keep Them Pt. II (Permanent Teeth)..... 5c
3. How to Build Sound Teeth—Children's Teeth Pts. I-II (Prenatal)..... 5c
4. The Promotion of Health in the Mouth..... 5c
5. The Masticating Machine 5c
6. What Bacteria Do in the Mouth..... 5c

Outlines of Lectures for Nurses

Two sets of outlines of lectures for nurses in training are available on request. No charge is made.

Talks For Lay Audiences

1. How Many Teeth Will You Have Left When You Are 80? (For radio audience).. 5c
2. Clean Teeth as an Asset (For high school pupils)..... 5c
3. The Care of Children's Teeth (For parent-teacher associations)..... 5c
4. Preventive Dentistry (For parent-teacher associations)..... 5c
5. A Constructive Program for Dental Health..... 5c
6. The Teeth and Health (For church audience)..... 5c
7. Lecture for High School Students..... 5c

Radio Talks

"Radio Talks" (booklet) contains 22 fifteen-minute talks covering a variety of dental topics; also includes brief instructions to radio speakers (price, 15c per copy).

The Bureau has also developed a large number of individual talks in convenient mimeographed form ready for use before the microphone. These cover many topics, most of them being designed for five minute broadcasting periods. They are available at 5c per copy or six for 25c. List of subjects furnished on request.

Pamphlets on Nutrition

1. "The Question of Foods," by Ethel Austin Martin, B.C., M.S..... 5c
2. "Practical Nutritional Suggestions for Dentists," by Percy R. Howe, D.M.D..... 5c

Stories, Plays and Rhymes

1. Better Teeth Better Health Stories..... 5c
2. Toothsome Stories 5c
3. The Story of the Food Chopper (for primary grades)..... 5c

4. The King's Soldiers (for primary grades) 5c
5. The Bad Baby Molar (dental playlet) 5c
6. Stepping Stones to Happiness (dental playlet) 5c
7. Grandfather Molar (dental playlet) 5c
8. Sells Health-O Circus 5c

(Through the courtesy of the Illinois State Department of Health, the Bureau is enabled to offer the privilege of using the manuscript and staging properties for the very excellent dental health play entitled "Sells Health-O Circus." Information as to the conditions under which circus properties are obtainable may be secured on request.)

Dental Programs

1. "Achievements and Results in West Va. of the Jenkin-Jones Dental Dispensary and McDowell County Dental Clinic," by G. T. Epling, D.D.S. 5c
2. "Public Health Dentistry in Santa Barbara County," by Leo Mollath, D.D.S. 5c
3. "Dentistry in Public Health," by C. T. Messner, D.D.S. 5c
4. "Significance of Clinical Experience as Related to Prevention for the Child Patient," by Lon W. Morrey, D.D.S. 5c
5. "New York Surveys Its Dental Clinics," by the Committee on Community Dental Service, N. Y. Tuberculosis and Health Association 5c
6. "What Is the Economic Value of Dental Health to the Community?" by Arnold M. Kegel, M.D. 5c
7. "Dental Health Week" by C. J. Hollister, D.D.S. 5c

Miscellaneous

1. To Boys 1c
2. To Girls 1c
3. To Mothers 1c
4. The First Permanent Molar 1c
5. "Facts Demanding Serious Professional Consideration as Disclosed by Dental Contact with the Committee on the Cost of Medical Care," by H. L. Phillips, D.D.S. ... 5c
6. "Proper Dental Care for the Child Patient," by T. A. Gardner, D.D.S. 5c
7. "The Preparation and Delivery of a Speech," by Bertram G. Nelson 5c
8. "Are Extension Courses a Success?" by J. B. Jenkins, D.D.S. 5c
9. "Prosthesis in Children's Dentistry," by F. B. Rhobotham, D.D.S. 5c
10. "Dental Internship in a General Hospital," by D. F. Lynch, D.D.S. 5c
11. "Outlines for Teaching Oral Hygiene from the Kindergarten to the Eighth Grade," by Emma P. Durbin, R.N. 5c

Quantity Quotations

1-10 copies, postage prepaid	5c each
10-100 copies, postage prepaid	4c each
100 copies, postage prepaid	$ 3.00
500 copies, express collect	11.00
1,000 copies, express collect	21.00

Special Notice: To assist the Bureau in eliminating unnecessary bookkeeping and correspondence, *please remit the amount of your order at the time of ordering.* Remit by post-office money order or stamps. *Please do not send personal checks for amounts of less than one dollar.*

* * * * *

Chart

"A Survey of Dental Diagnosis During Childhood" 15c

An excellent and comprehensive chart on diagnosis, developed by one of the country's outstanding specialists in children's dentistry. Every dental practitioner needs one. Very useful to a hygienist, nurse, and physician.

Posters

For children, size 20 by 30 inches, in colors, on high grade cardboard; designed to encourage the child in the care of the teeth.

For adults, size 20 by 30 inches, in colors, on high grade cardboard; designed to interest parents in the care of children's teeth.

$1.00 each. Payment must accompany the order.

* * * * *

LANTERN SLIDE AND MOTION PICTURE FILM SERVICE

Lantern Slide Lectures:

1. "The Tooth Question," lecture (for adult audiences); 42 slides. (Requires one hour to present.)
2. "The Mouth and Its Message," lecture (for adult audiences); 13 slides. (Requires thirty minutes to present.)
3. "Every Child's Treasure," lecture (for school children of first six grades); 31 slides. (Requires thirty minutes to present.)
4. "The D. Kay Brownies," lecture (for school children of first four grades); 10 slides. (Requires twenty minutes to present.)

Note: Copies of the foregoing lectures are furnished free, although a small rental fee is charged for the slides (see lantern slide service).

5. "Johnny Don't Care's Teeth" (for fourth to eighth grade children); 22 colored slides. Self-explanatory; no written lecture necessary.

Lantern Slide Rental Service:

The Bureau has a large collection of slides (standard size, 3¼ by 4 inches) suitable for professional and lay groups. A complete list of these slides will be furnished on request. Any selection of slides may be rented on the basis of $1.00 a day or $3.00 a week, plus shipping charges both ways. No charge is made for time in transit or time spent in review. In requesting slides (provided you do not order from our list), please state the topics that you desire to cover, type of audience, number of slides, when wanted and length of time desired. The renter is held responsible for all breakage.

Lantern Slide Sale Service:

The Bureau will sell duplicates of any stock slides at the following prices: plain slides, 35c each; colored slides, 75c each. On request, the Bureau will prepare slides from photographs or cuts on the following basis: *plain slides:* negative, 25c; slide, 35c, making total cost for each original slide 60c; *colored slides:* negative, 25c; slide, 75c; making total cost for each original slide $1.00. *Remittance must accompany all orders.*

MOTION PICTURE FILM SERVICE

Dental educational films are available in both 35 m.m. and 16 m.m. stock. These may be rented for $1.00 a day or $3.00 a week, plus shipping charges both ways. Charge is made for each day of use before an audience, but no charge for time in transit. The renter is held responsible for injury to films. *In requesting films, please state the ones desired, when desired and for how long.* Following is a description of the films available:

"Your Mouth" (35 m.m.), 15 minutes. Synopsis: Gives cause, progress and results of tooth decay; methods of prevention; brings in nutritional aspect, use of roentgen rays, brushing, etc. Suitable for high school and adult audience.

"Tommy Tucker's Tooth" (35 m.m. and 16 m.m.), 15 minutes. Synopsis: The "Tell-a-Story-Lady" narrates to a group of children the importance of keeping teeth in good condition. Animated scenes used effectively.

"Clara Cleans Her Teeth" (35 m.m. and 16 m.m.), 15 minutes. Synopsis: Clara, aged 10, always neglected her teeth until she learned, through her playmates, the importance of daily brushing and care. Interesting story which impresses lesson effectively.

"Tommy's Troubles" (35 m.m.), 20 minutes. Synopsis: On oral hygiene. Emphasizes importance of diet as well as cleanliness in care of teeth; shows proper method of brushing them.

"Bobby's Bad Molar" (35 m.m. and 16 m.m.), 15 minutes. Synopsis: Bobby has neglected his teeth and is paying the penalty by doing poor work in school, being backward in athletics, etc. One day his teacher sends him to the school dental hygienist, who examines his teeth. The hygienist explains Bobby's teeth troubles to him and urges him to go to the dentist at once and receive attention. Bobby takes her advice and finally becomes an enthusiastic advocate of the proper care of teeth.

"Life of a Healthy Child" (16 m.m.), 15 minutes. Synopsis: Illustrates healthful activities of a normal school child. Habits of cleanliness, correct diet, carefree play, visits to dentist and physician are emphasized. Excellent for parent-teacher groups or child audiences.

"Ask Your Dentist" (35 m.m. and 16 m.m.). Excellent for high school and adult groups. Stresses the importance of diet, cleanliness and dental attention. A touch of humor is added by the use of cartoons.

"How Teeth Grow" (16 m.m.), 15 minutes. Synopsis: Eastman classroom film for health education. Shows in interesting and instructive manner growth and development of temporary and permanent teeth. Demonstrated through use of animation, models, and subjects of various ages. (For children and adults.)

"Care of the Teeth" (16 m.m.), 15 minutes. Synopsis: Eastman classroom film for health education. Shows various phases of care of teeth such as diet, care by dentist, brushing and home care. Useful in giving fresh support to activities of dental hygiene program. Designed for individuals above fourth grade.

Technical Film: "The Physiology of Mastication" (16 m.m.); 2 reels. Synopsis: Study of jaw movements of various animals exhibiting types of mastication as an introduction to study of human beings. Animated skulls and cartoons are synchronized with mandibular movements of animals. The film shows that "three point contact" and "bilateral balanced occlusion" never occur in lower animals during process of incising and chewing tough resistant food.

Technical Film: "Mechanics of Balance in Dental Prothesis" (16 m.m.); 1 reel. Synopsis: Depicts clinical application of unilateral balance to prosthetic dentistry. Film is a continuation of the above-mentioned film, "The Physiology of Mastication."

Technical Film: "Uses of Gelatin in Dental Arts" (16 m.m.); 2 reels.

PER CAPITA SUBSCRIPTION OF STATES TO RELIEF FUND

The total amount subscribed to the Relief Fund of the American Dental Association for the year ending June 30, 1933, was $13,542.87. This is an average of 57 cents per member.

The following is the per capita subscription for each state.

Alabama	$0.16	Nebraska	$0.23
Arizona	4.44	New Hampshire	.44
Arkansas	.12	New Jersey	.54
Army	.40	New Mexico	.72
California State	.37	New York	1.09
California South	.34	North Carolina	.24
Colorado	.35	North Dakota	.39
Connecticut	.45	Ohio	.32
Delaware	1.12	Oklahoma	.23
District of Columbia	.59	Oregon	.59
Florida	.25	Panama Canal Zone	.45
Georgia	.24	Pennsylvania	.58
Idaho	.40	Puerto Rico	.22
Illinois	.52	U. S. Public Health Service	.22
Indiana	.36	Rhode Island	.47
Iowa	.41	South Carolina	.14
Kansas	.29	South Dakota	.28
Kentucky	.25	Tennessee	.26
Louisiana	.33	Texas	.63
Maine	.50	Utah	.32
Maryland	.58	U. S. Veterans Bureau	.13
Massachusetts	.44	Vermont	.29
Michigan	.47	Virginia	.45
Minnesota	.38	Washington	.30
Mississippi	.16	West Virginia	.26
Missouri	1.36	Wisconsin	.39
Montana	.33	Wyoming	1.12
Navy	.39		

Charity Begins at Home

The dental profession, through the Relief Fund, is caring for many dentists who are down and out.

The contribution which you make all goes to the Fund. There is no overhead. There are no salaries paid. The only expense is that of printing the Seals and taking care of the correspondence relative to the distribution of them.

We are our brothers' keepers; we who have are obligated to care for those who have not.

The letters which are received from these men and their families are pitiful in the extreme. No one can read them without feeling that he must give liberally.

The need is very great. Make your contribution a little larger than it was last year, for it is needed as it never was before. The Fund means food and warmth for many and it will keep some from the Poor House.

The Dental Relief Fund Committee

R. Ottolengui, *Chairman*
Fred R. Adams, *Secretary*
Olin Kirkland
C. E. Peterson
Charles P. Grosby

OFFICERS AND TRUSTEES OF THE AMERICAN DENTAL ASSOCIATION
1933-1934

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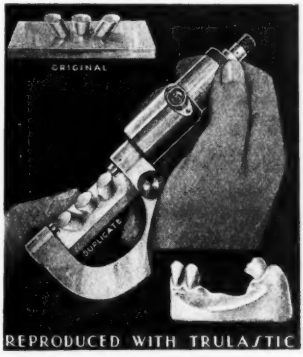

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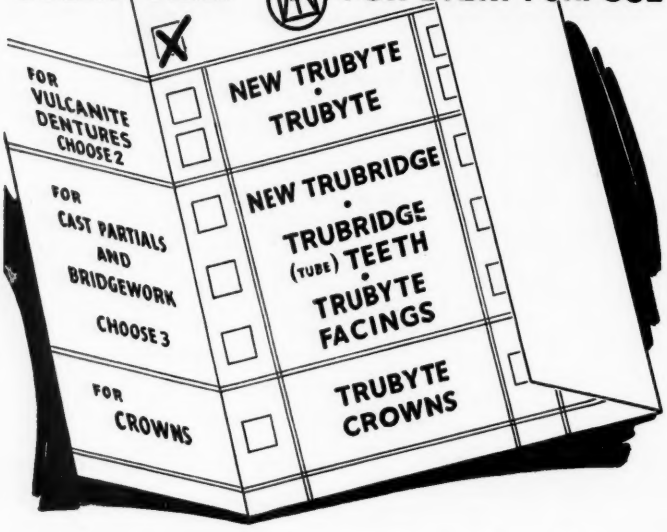

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